UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 271

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C. PROFESSIONAL PAPER September 28, 1915

DATES OF EGYPT AND THE SUDAN

By

S. C. MASON, Arboriculturist, Crop Physiology and Breeding Investigations

CONTENTS

	Page		Page
Introduction	1	Description of Varieties	17
Nile Valley Dates and Their Climatic Environments	3	Summary	39

IMP. BUR.
1 - DEC. 1915
ENTOM.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 271

Contribution from the Bureau of Plant Industry,
Wm. A. Taylor, Chief.

Washington, D. C. PROFESSIONAL PAPER September 28, 1915

DATES OF EGYPT AND THE SUDAN.

By S. C. Mason,
Arboriculturist, Crop Physiology and Breeding Investigations.

CONTENTS.

Introduction 1
Nile Valley dates and their climatic environments 2
Description of varieties 17
Summary 39

INTRODUCTION.

The earliest importation of date offshoots into the United States (a lot of 59 received through correspondence by the Department of Agriculture in July, 1890) was from Egypt.

Eleven years passed before Mr. David Fairchild, Agricultural Explorer, of the Bureau of Plant Industry, visited Egypt and obtained offshoots of a number of the leading varieties. Small lots of Egyptian offshoots were secured through agents in later years, but the fact remained that the dates of Egypt, of which there are more than 7,000,000 trees, were less thoroughly known to American experimenters than those of any other great date-producing region. In the published lists of Egyptian dates there was much confusion and contradiction, and the identity of some of the more promising of the Egyptain varieties on trial at the Tempe and Mecca date gardens was in doubt.

These considerations induced the offices of Crop Physiology and Breeding Investigations and of Foreign Seed and Plant Introduction to combine in sending the writer to Egypt and the Sudan in August, 1913. An account of the journey in these countries, from August, 1913, to February, 1914, is embodied in another paper, but the descriptions of 22 varieties of dates of Egypt and the Sudan, comprising most of the commercial dates of those regions, as well as of several varieties of minor importance not heretofore published, are assembled in this bulletin.

96613°—Bull. 271—15——1

The purchase of offshoots of the most desirable varieties was effected through the courtesy of Egyptian and Sudan officials, to whom the Department of Agriculture is also indebted for much important information bearing upon cultural conditions.

The analyses of the official weather records of Egypt and the division of the Nile Valley into three zones in accordance therewith throws much new light on the culture of dates in general and especially upon the behavior of the groups of varieties under consideration.

NILE VALLEY DATES AND THEIR CLIMATIC ENVIRONMENTS.

No one would venture to declare the age of date culture in Egypt, but from the intercourse which the Egyptians are known to have had with the neighboring date-growing lands at a very remote time, there can be little doubt that the Egyptian people cultivated the date at an early day. In the great Hall of Columns at Karnak, attributed to the nineteenth dynasty, or 1,370 years B. C., many of the columns are clearly modeled from a date tree, the capital being the spreading leaves as they appear from beneath. We can hardly doubt that date groves flourished then in the rich Nile lands even as they do to-day.

With the more than 7,000,000 date trees growing in Egypt to-day, their product does not suffice for the wants of 11,000,000 people.[1] There is a small exportation of dates to Europe from the delta, chiefly of the Amri variety,[2] but this is more than offset by the importation of dates in fancy packages from Algeria and the Persian Gulf and by the shipments of dry dates from the Sudan, a considerable proportion of the date crop of Dongola Province finding its way down the river.

The dates described in the following paper comprise the chief commercial varieties of Egypt, including the western oases and the Sudan. The descriptions are from notes made in August to December, 1913, by the writer during a journey through the region described. Several varieties of minor importance which it is believed have not before been published are included.

The writer makes no pretense that this bulletin presents a complete list of Egyptian or Sudan varieties, which are exceedingly numerous, for little attempt has been made to secure the names even of the many seedling sorts which have received names and have been propagated in a small way by their originators. Of the

[1] The official census of the date trees for taxation in 1907 is 5,966,010. Trees in gardens and estates which pay a tax are not listed for separate taxation; also young trees under a certain minimum size are not listed for taxes. These two classes of exemptions would add very greatly to the actual number of date trees in the country. Sir William Willcocks estimated the total number of date trees in Egypt in 1899 at about 7,400,000, producing fruit annually valued at £1,480,000. This would make the value of the annual date crop a little below $1 per tree.

[2] In the Annual Statistics of the Egyptian Ministry of Finance for 1912 the average yearly exportations of dates for the years 1905 to 1911 is given as 576,135 kilos, valued at £8,945, which would be, in round numbers, 1,267,000 pounds, at 3½ cents per pound.

6,000,000 date trees enumerated for taxation in Egypt, it is safe to assert that two-thirds are of the balady, or seedling, type of trees, of which the greater number produce fruit of low quality which is consumed by the poorer people in the immediate vicinity.

Among these, however, may occur occasional varieties of superior excellence, in rare instances ranking with any of the sorts now in cultivation. In a population of more advanced ideas in horticulture such varieties would be propagated to the utmost limit and their dissemination made as rapid as the slow nature of the date tree would admit. In Egypt such varieties are often confined to the garden in which they originated or to distribution among the immediate family of the owner. In one instance which came to the writer's knowledge a seedling variety not surpassed by any of the well-known sorts of Egypt was still confined to the garden where it originated, the property of a sheik of considerable wealth and position. The "mother" tree and five "daughters" have passed the age of producing offshoots. On a single "granddaughter" hangs the fate of this valuable variety.

The task of searching out such chance varieties of merit throughout Egypt would be an interminable one, but the results would doubtless repay the effort.

Date culture in Egypt and the Sudan extends with scarcely an interruption from the relatively cool Mediterranean coast up the Nile Valley to the burning desert heat of Aswan, and is paralleled in the Libyan oases of Fayum, Siwah, Baharieh, Farafreh, Dakhleh, and Khargeh. Above the first cataract, owing to the narrowing of the valley, the continuity of the date trees is a good deal broken, yet it may be considered a continuation of the culture through Ibrim, past Wadi Halfa, and up to the Sukkot region, around the great bow of the river past old Dongola, Merowe, Abu Hamed, and Berber to Khartum itself, where, entering the fringe of the great tropical rainy region, the limit of practical date culture to the southward is reached. (Pl. I.) This gives a north-and-south extent to the Nile Valley date culture of about 16 degrees of latitude, or approximately 1,100 miles, about equivalent to the distance from the mouth of the Mississippi River to Minneapolis and St. Paul. This is the longest continuous north-and-south extension of date growing to be found in the world, and it becomes of peculiar interest from the range of temperatures embraced and the differences in climatic conditions encountered. The difference in the mean annual temperature between Alexandria and Khartum amounts to about 15 degrees F., though the average difference for March, April, and May is over 21 degrees. This difference is not great when the difference in latitude is considered,[1] but

[1] The difference in mean annual temperatures between St. Paul and New Orleans, the similar distance previously cited, is about 25 degrees Fahrenheit.

when taken in connection with a fruit as exacting in temperature requirements as the date it becomes of very great importance.

Another important factor in the environment of the date tree is the relative humidity of the air, which along the Mediterranean coast, where there is an extensive culture, is very high throughout the year. At Alexandria, with a record of 23 years, the mean monthly range of relative humidity is from 64 to 72 per cent, with an annual mean of 68, some years running to 71 per cent. At Gizeh the mean relative humidity of a 10-year record is 69 per cent, with single monthly means as low as 50 and as high as 84 per cent. At Heluan the desert influences begin to be felt, and the mean relative humidity is reduced to 54 per cent, and at Siut (Assiut) it is 53 per cent. Aswan gives a record of 39 per cent humidity as a mean for 11 years, while the Oasis of Dakhleh, on a record of 7 years, shows real desert dryness, with a mean humidity of only 36 per cent, and Wadi Halfa, on a 20-year record, has the low mean of 34 per cent.

No weather records are available for the Sukkot region, formerly so important, but now superseded in the volume of date production by Dongola Province. Merowe, the capital of Dongola, fortunately has very complete records for recent years and shows the greatest dryness of any date region yet studied, its mean relative humidity for the year being only 24 per cent. For May, the driest month, the record is only 12 per cent on a 5-year mean; 30 per cent in August and 31 per cent in January, the most humid months.

Passing the fourth and fifth cataracts with considerable date culture in Berber Province, at the next weather station, Atbara Junction, influenced by the nearness of the rainy hill region on the east and southeast, the mean humidity rises to 38 per cent, reaching 50 per cent in August, with occasional records for April and May as low as 16 per cent. At Khartum, beyond which few date trees are found, the mean humidity for the year drops to 33 per cent.

For convenience in studying the character of the dates produced as related to their environment, the region under consideration may be divided as follows:

(1) The maritime subtropical: Comprising Lower Egypt, or the Nile delta, including lower Gizeh.

(2) The desert subtropical: Comprising Upper Egypt to Aswan, with the Libyan oases.

(3) The desert tropical: Comprising Upper Egypt beyond Aswan and the Nile Valley in the Sudan at Khartum.

Hard and fast lines are difficult to draw, and if there were a greater number of observation stations it is probable that points on the margin of the delta toward the desert, like Salihieh and Korain on the eastern border of the delta and Manshia to the west of Gizeh, would show temperature and humidity conditions which would place them

in the desert zone rather than among maritime stations. The evidences of this in the record of 38 years at Abbasia, a military post in the unirrigated uplands in the northeast suburbs of Cairo, and in incomplete records at Ismailia on the Suez Canal are discussed in subsequent pages.

Table I gives the meteorological data for all the stations at which weather records are available in the three great climatic zones, with the characteristic date varieties for each type of climate.

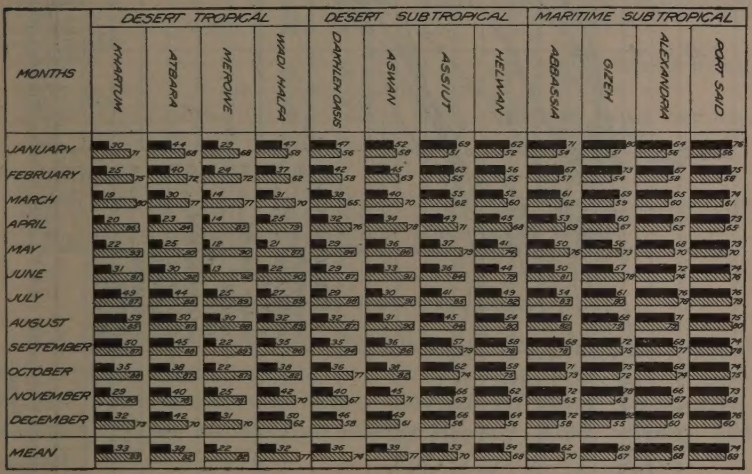


FIG. 1.—Diagrams showing the mean monthly relative humidity (in percentage of saturation, dark bars) and the mean monthly temperature (in °F., shaded bars) for 12 stations in Egypt and the Sudan.

Figure 1 shows the mean monthly relative humidity (in percentage of saturation) by the use of dark-faced bars and the mean monthly temperatures (in degrees Fahrenheit) by the use of tint-lined bars immediately below, in diagrammatic form, for twelve stations in Egypt and the Sudan.

Figure 2 shows by curves the mean monthly temperature (in degrees Fahrenheit) and the relation of the monthly mean to the assumed "zero point" (64.4° F.) of the date in flowering for the twelve weather-observing stations listed in Table I.

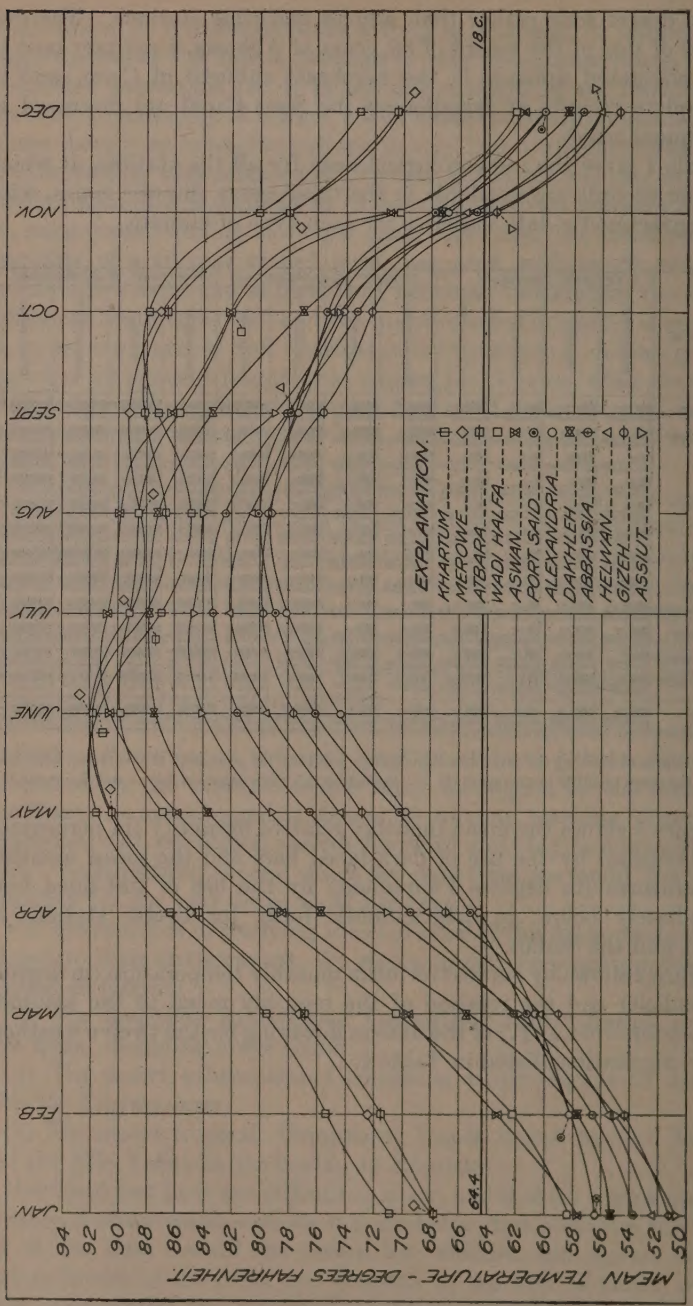


FIG. 2.—Curves showing the mean monthly temperatures in relation to the assumed "zero point" (64.4° F.) of the flowering of the date palm for 12 localities in Egypt and the Sudan.

TABLE I.—*Meteorological data for stations in the three great climatic zones of Egypt and the Sudan, showing the characteristic date varieties for each type of climate.*

Zone and locality.	Mean relative humidity.	Mean temperature (° F.).		Heat units above 64.4° F., May 1 to Oct. 31.	Varieties of dates grown.
		Annual.	February to October.		
Maritime subtropical:					
Alexandria	68	68.32	70.36	2,049	Aglany, Amri, Bint Aischa, Hayany, Kobi, Samany, Zagloul.
Port Said	74	68.95	70.86	2,191	
Gizeh	69	67.28	70.86	2,179	
Abbasia	62	69.96	73.68	2,714	
Desert subtropical:					
Bedrashen					Amhat, Hamrawi, Hayany, Siwah.
Heluan	54	68.90	72.54	2,596	
Fayum					
Siut (Assiut)	53	70.29	74.08	3,147	Saidy, Sultany, Tamr, Hamrawi, Falig.
Dakhleh	36	73.92	78.40	3,675	
Aswan	39	77.30	81.92	4,296	Barakawi, "Bartamoda," Gondeila, "Ibrimi."
Desert tropical:					
Ibrim					"Ibrimi," Barakawi, Bentamoda, Gondeila, Kosha, Kulma.
Wadi Halfa	34	77.05	81.54	4,160	
Merowe	24	81.84	85.61	4,708	
Atbara	38	81.73	84.95	4,454	
Khartum	33	82.95	85.69	4,396	

THE MARITIME SUBTROPICAL ZONE.

Of the 22 varieties of dates here listed, 7 are grown only in the delta, or their culture extends but a short distance into Upper Egypt. Of these, 5 varieties are used only in the fresh, or "rutab" (succulent), condition. These are the Bint Aischa, Hayany, Kobi, Samany, and Zagloul.

The territory represented by these varieties has the three meteorological stations of Alexandria, Port Said, and Gizeh (Table I), which gives almost uniform mean temperatures, the annual means varying less than 2 degrees and the means for the 9 months of the growth of the flower stalk and fruit, February to October, inclusive, being almost uniformly 70° F.

In explanation of the significance of column 5 of Table I, headed "Heat units above 64.4° F.," the following extracts from pages 63 and 65, Bulletin No. 53 of the Bureau of Plant Industry, by Walter T. Swingle, including table 9, from page 66 of the same bulletin, are here given:

It has been calculated by De Candolle that temperatures down to 18° C. or 64.4° F. have no effect on the flowering or fruiting of the date palm, and a study of the record sheets of a self-recording thermometer kept at Biskra in the midst of a date orchard confirmed the correctness of this assumption. In other words, this relatively high temperature is the zero point for this plant, so far as flowering and fruiting are concerned, though it is able to grow at somewhat lower temperatures. . . . The table [table 9] gives the summation of effective temperatures during the fruiting season of the date palm for a number of points in North Africa and in the Southwestern States.

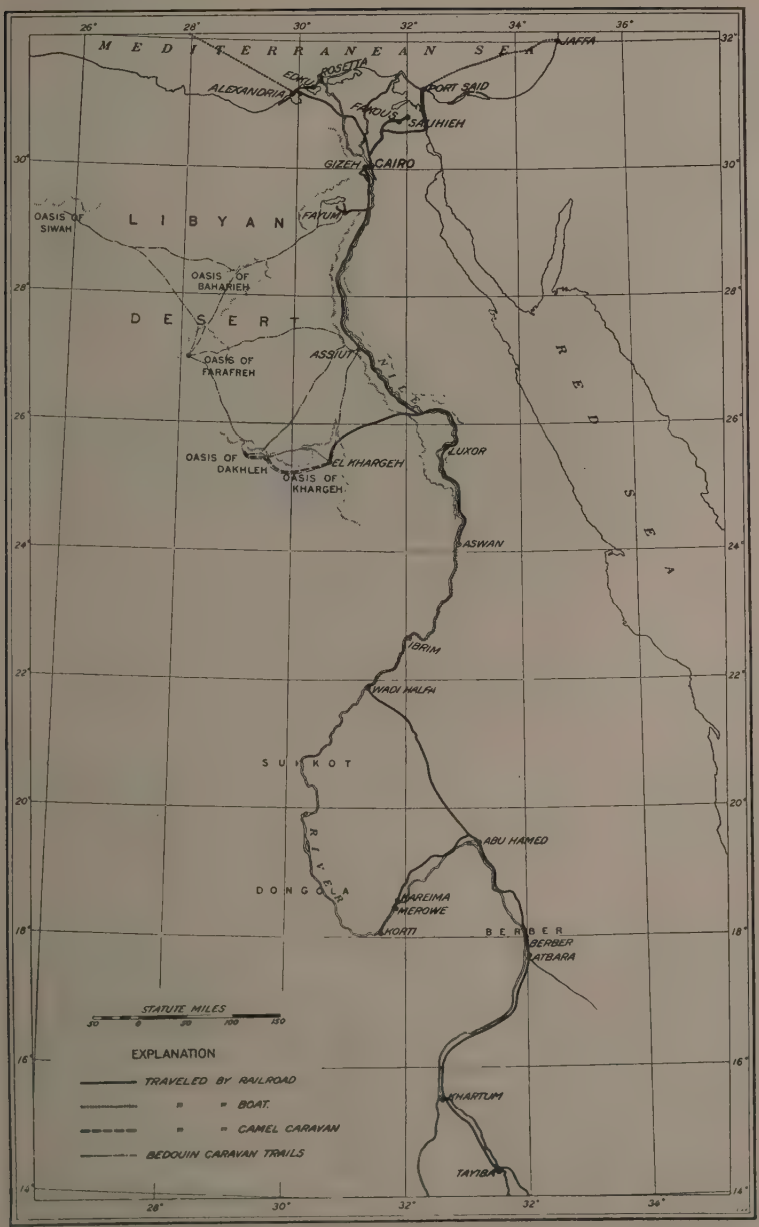
TABLE 9 [*Swingle*].—*Sum of daily mean temperatures above 18° C. (64.4° F.) for fruiting period of date palm from May 1 to October 31, at the stations named.*

Locality.	Sum of daily mean temperatures above 18° C. (64.4° F.) from May 1 to Oct. 31.		Remarks.
	Degrees centigrade.	Degrees Fahrenheit.	
Algiers, Algeria	652	1,174	No dates ripen here.
Orleansville, Algeria	788	1,418	Very early sorts mature.
Fresno, Cal	1,054	1,897	Average of many years' observations. Dates of sorts grown usually fail to ripen.
Tucson, Ariz	1,409	2,538	Average of 6 years' observations. Dates of the sorts now grown usually fail to ripen.
Cairo, Egypt	1,593	2,868	Dates ripen regularly.
Phoenix, Ariz. (Salt River Valley).	1,677	3,019	Average of many years' observations. Many sorts of dates ripen regularly.
Biskra, Algeria (Northern Sahara).	1,836	3,304	Average of 10 years' observations. Many sorts of dates ripen regularly; date culture the leading industry. Deglet Noor dates ripen but are not of the best quality.
Ayata, Algeria, 1890 (Oued Rirh region), Sahara.	1,816	3,269	Deglet Noor dates ripened very imperfectly.
Ayata, 1891	1,906	3,431	Deglet Noor dates ripened very slowly and imperfectly.
Ayata, 1889	2,091	3,764	Deglet Noor dates ripened well.
Tougourt, Algeria (Oued Rirh region).	2,049	3,689	Do.
Bagdad, Mesopotamia	2,356	4,242	Average of 5 years' observations. Many excellent varieties ripen.
Indio, Cal. (Salton Basin)	2,237	4,027	Average of several years' observations.
Indio, 1903	2,348	4,227	New thermometers.
Mammoth Tank, Cal. (Salton Basin).	2,585	4,652	Average of 23 years' observations.
Salton, Cal., 1903 (Salton Basin).	2,074	3,734	The coolest summer recorded. Observations taken for the first time with standard Weather Bureau thermometers in the regulation shelters.
Salton, mean	2,679	4,823	Average of 12 years' observations.
Salton, 1897	3,392	6,106	Hottest summer recorded at Salton.
Salton, 1902	2,749	4,948	
Imperial, Cal., 1902 (Salton Basin).	2,106	3,791	

In those calculations 64.4° F. is assumed as the zero point of activity of the date tree as far as flowering and fruiting functions are concerned, any number of degrees of daily mean temperature above that point being available to the tree in forwarding its fruiting functions, though growth of leaves and stem may go on at temperatures considerably lower.

By multiplying the number of degrees above 64.4 in any monthly mean by the number of days of that month the number of available heat units (1 degree 1 day) is arrived at. The summations for the months of May to October, inclusive, in column 5 of Table I have been arranged for comparison with those of the table quoted from Swingle.

The summations of 2,049 heat units for Alexandria and 2,179 units for Gizeh must be fairly representative of the conditions under which the greater number of the date trees of the five varieties mentioned make their growth. (Pl. II.) By comparison with table 9 of Bulletin No. 53, referred to, it will be seen that localities having such low summations are not counted in the possible date-growing territory, except



MAP OF EGYPT AND THE SUDAN, SHOWING THE ROUTE OF TRAVEL AND THE LOCALITIES WHERE DATES WERE STUDIED.

FIG. 1.—A GROVE OF HAYANY DATES ON SANDY, UNIRRIGATED SOIL NEAR RAMLEH, ON THE MEDITERRANEAN COAST.

Ground water is found at a depth of about 14 or 15 feet.

FIG. 2.—DATES AND VINES NORTH OF THE RAILROAD TRACK, EAST OF RAMLEH, PLANTED IN DEEP TRENCHES IN THE SAND SO THAT THEIR ROOTS MAY REACH GROUND WATER.

Note the sand drift in the foreground.

for a few exceptionally early sorts.[1] This apparent discrepancy may be explained for United States localities by the frost interference in the spring and fall, while the Nile delta region is practically frostless; the coast entirely so, while the Gizeh district is subject to rare and only light frosts. With frost immunity in autumn, the dates of the Egyptian maritime belt may hang on the trees, slowly maturing, even after the mean temperature falls below 64.4° F., as it does by the first to the middle of November. It must be remembered, too, that these dates do not mature upon the trees, but are cut and marketed in what is called a "hard ripe" condition, the sugar deposits being probably completed, but with the enzymic actions which promote the ripening not yet begun.

This region, having a mean temperature of 70° F. from February to October, inclusive, does not produce packing dates at all. The Amri, the one important packing date of the delta, is produced at Salihieh, Korain, Fakus, and a few at Birket el Hadji, all points in the margin of the delta lands bordering on areas of bare desert sands. (Pl. III, fig. 1.) Manshia, on the margin of the delta, a few miles north of the Gizeh Pyramids, where considerable quantities of both Amhat and Siwah dates are cured, has a climate so influenced by the proximity of the Libyan Desert that it should be considered under the same category. The record of Abbasia, the suburb of Cairo on the rocky slopes of the naked hills to the northeast of the city, may be taken as most nearly representative of these border localities, especially of Birket el Hadji and Manshia. Here (Table I) the mean for the year is but a fraction below 70°, that for the growing months of February to October being 73.68°; and the summation of heat units from May to October is 2,714. An incomplete record for Ismailia,[2] on the Suez Canal about 25 and 30 miles southeast of Salihieh and Korain, agrees within an average of 1° in the monthly means with the records of Abbasia and gives an almost identical summation of heat units above 64.4°. The mean relative humidity is between that of Abbasia and that of Heluan, but with less fluctuation than either.

Even with the additional heat afforded by these localities on the desert border, the dates are pulled from the stems in an immature "hard ripe" condition, and the ripening is completed in drying yards, preferably on floors of coarse pebbles to reflect the heat.

It is from such higher temperature conditions at Birket el Hadji, where their groves border the sand hills toward the open Arabian

[1] Thomas H. Kearney, on pages 20 and 21 of Bulletin 92 of the Bureau of Plant Industry, entitled "Date Varieties and Date Culture in Tunis," shows that at Susa on the Mediterranean coast, 120 miles north of Gabes, two varieties of dates are grown where the summation of heat units is probably less than that of Sfax (1,968° F.). These are, however, varieties of inferior quality and the fruit keeps but a short time after gathering.

[2] Lyons, H. G., Physiography of the Nile River and Its Basin, 411 p., 48 pl. Cairo, 1906.

Desert, that the Hayany reaches its earliest maturity, coming to the markets as "Bala Birket el Haggi" (dates of Birket el Hadji) the first of September. It is doubtless with a view to catching this early market that large plantations of the Hayany are being made on the sandy lands in Gizeh Mudirieh, bordering the Libyan Desert above the Great Pyramids.

THE DESERT SUBTROPICAL ZONE.

The next distinctive zone of date culture comprises the narrow Nile Valley of Upper Egypt, from Gizeh to Aswan, and the Libyan oases of Fayum, Siwah, Baharieh, Dakhleh, and Khargeh. For a proper understanding of the conditions, this zone should be considered under three subdistricts: (1) Upper Gizeh, (2) Fayum and the Nile Valley to Aswan, and (3) the western Libyan oases.

SUBDISTRICT OF UPPER GIZEH.

While upper Gizeh includes but a small area, it is decidedly distinctive in the character of the dates grown and the methods of culture and handling. For its temperature records and the number of available heat units we must look rather to the records of Abbasia and Heluan than to those of the Gizeh station.

Proximity to the Arabian Desert on the east and to the Libyan Desert on the west gives to this district, best represented in the vicinity of the railway stations of Bedrashen and Hauamdiyeh, a climate distinctly hotter and drier than that of the delta proper and only prevented from being still more desertlike by the prevailing northerly winds which, blowing from the Mediterranean over the irrigated delta, have only begun parting with their watery vapor and are but slowly acquiring the desert heat. However, a difference of a few degrees in the mean temperature of the growing months, and the accumulation of about 500 more available heat units, enable the growers of this district to produce a packing date equal to the best in Egypt and only awaiting the development of modern, sanitary, and attractive methods of handling to take its place with the Deglet Noor and Fard dates, which are imported to supply the high-class trade in Cairo. The Siwah is the important variety of this section, though considerable quantities of the Amhat are also packed. (Pl. III, fig. 2.) Detailed descriptions of the Siwah and the discussion of the problem of its relation to the Saidy of the oases will be found in the following pages.

The points of greatest economic importance to Egypt are, first, that this valuable variety, the Siwah, could be grown as well or even better on up the valley past Wasta and to the great date-growing section about Assiut and in the Fayum, where it is only beginning to be planted. It could very profitably replace thousands of balady, or seedling, trees of those districts, the low-grade fruit of which is scarcely more valuable than the leaf products.

The second economic point is that to get the real profit the present careless and filthy methods of curing and packing must give way to modern sanitary methods, and the fruit, in itself really of high quality, must be packed in neat, attractive boxes or cartons, when it would command three times the retail price it brings to-day.

SUBDISTRICT OF FAYUM AND THE NILE VALLEY.

The valley portion of the desert subtropical zone, beginning above Gizeh and extending, for convenience, to the first cataract, at Aswan, comprises the provinces of Beni Suef, Minieh, Siut (Assiut), Girgeh, Kench, and Aswan, with a total of over 3,000,000 taxed date trees, or more than half of the entire number of the taxed trees of Egypt. While a few of the choicer named varieties are grown in gardens of well-to-do people, nearly the entire number of these trees are of the balady, or seedling type, of every color and character, though those of superior quality are few, and there is a strong leaning toward the dry types. It is doubtful whether anywhere else in the world can be found so large a number of date trees of so low a commercial quality and containing so small a number of trees of standard varieties and uniform product. The nearly a half million date trees of Fayum are of about the same character, and from the similarity of the climate to that of the northern portion of Upper Egypt Fayum is included with the valley division of the desert subtropical zone.

If one but for a moment considers the possible difference between financial returns which would be realized from these millions of balady, or seedling, trees and an equal number of such valuable varieties as might be grown in their places, the results are astounding. Sir William Willcocks's estimate of the annual value of the product of 5,200,000 date trees of Upper Egypt at £1,040,000 makes the average value of each tree only 4 shillings, or about $1. Remembering that this portion of the Nile Valley and the depression of the Fayum afford ideal conditions for growing the choicest of the world's date varieties, we should picture these sections as planted with such choice Egyptian varieties as the Siwah, the oasis Saidy, the Algerian Deglet Noor (which would find its optimum temperature conditions about Kench or Luxor), and some of the most valuable Arabian varieties.

From the most reliable estimates that could be obtained at Bedrashen, the annual revenue realized by the grower of the Siwah variety would be about $2.50 per tree, even with the present crude methods of handling. The Saidy, apparently adapted to the higher heat conditions of the upper valley, would be no less profitable. With modern packing methods the above figures could at least be doubled. If the quality of the trees of this section could be so changed that they would be bringing an annual return of £1 per

tree instead of one-fifth of that sum, over £4,000,000 would be added to the income of these people. This £4,000,000 a year added to the value of the date crop of this narrow stretch of valley of about 500 miles in length would vastly change the economic conditions of Upper Egypt. Of course, it would require years to bring about such a change, to convince the native cultivators of the desirability of such a change being the most difficult part of the problem. To develop the market for the higher-priced product would also require time. All of this suggests that the excellent work on dates already begun by the horticultural division of the Egyptian Department of Agriculture might profitably be very greatly expanded.

In the upper end of the valley division the mean temperature rises almost to that of the desert tropical, and the air is of a desert dryness. Here it is not surprising that we find considerable numbers of the date varieties from Nubia, the Sukkot country, and Dongola. What may be considered their fancy varieties, the "Bartamoda," Gondeila, and Kulma, are represented by only a few trees, to be sure, but the valuable dry date, Barakawi of Dongola (here called "Ibrimi") is a good deal planted, and apparently any seedling with a close resemblance to it is admitted into the family.

SUBDISTRICT OF THE LIBYAN OASES.

The Libyan oases have a date industry related throughout the series by the culture of one valuable packing variety, the Saidy. (Pl. IV, fig. 1.) A number of other varieties, as the Frihy, Gazaly, Kaiby, and Wedi, seem to be common to Siwah and Baharieh, but are not known in Dakhleh and Khargeh. But the great export date of all these oases is the Saidy. Whether, as the name suggests, this was originally from that part of Upper Egypt known as "Es Siyd" is wholly a matter of conjecture. The fact that it is scarcely at all known there now would make this explanation doubtful.

No data are available concerning the oasis of Siwah, either as to weather conditions or the number of date trees. The only meteorological records for these oases are those kept at Mut,[1] the capital of Dakhleh, which are given in the annual report of the Ministry of Finance for the years 1905 to 1911, inclusive. The data here would be fairly representative for Khargeh, but doubtless a few degrees too warm for Baharieh and Siwah. Table I shows that the mean annual temperature for Dakhleh is a little above a mean between Siut (Assiut) and Aswan, while the dryness of the air is greater than at Aswan and next to that of Wadi Halfa. The available heat units above 64.4° F. reach 3,675, which is very close to the optimum for the Deglet Noor at Tuggurt (Tougourt), in Algeria (quoted table 9,

[1] Pronounced "moot."

p. 8), where that variety is at its best, though probably the air at Dakhleh is much drier.

This comparison throws light on the heat requirements of the offshoots of the Saidy, which we are now importing, and suggests that the Coachella and Imperial Valleys of California will probably prove best adapted to its culture. As seen by the writer at Khargeh and Dakhleh, and after arrival at Fayum by camel from Baharieh, these dates are packed in solid masses in flattened baskets of braided date-leaf pinnæ, holding 80 or 160 rotls each; that is, either four or two of them make an ardeb weight of about 320 pounds, the usual camel load. At Dakhleh the usual price is about 50 piasters, or $2.50, for an ardeb, but in years of crop shortage the price advances sometimes to 70 piasters, or about $3.50 per ardeb, even this being but a fraction over a cent a pound. The best information available shows that they bring wholesale about 3½ cents a pound in the valley and retail in the stalls at 1 piaster per rotl, or about 5 cents a pound.

The Corporation of Western Egypt, an English syndicate which formerly operated a series of trading stores in Dakhleh, tried the experiment of packing these dates in attractive cartons for the English market, but, while they found a ready sale, the extra cost of camel transportation to the railroad necessitated by the improved pack, left very little margin for profit. With rail and steamer transportation at the door, so to speak, in Nile Valley towns, this excellent oasis variety ought to be a very profitable one to plant in the portions of Upper Egypt having temperatures most nearly corresponding with the oases, probably Girgeh and Keneh Provinces, which are now taxed on 1,250,000 unprofitable balady trees.

THE DESERT TROPICAL ZONE.

The desert tropical zone is marked by a decided increase in temperature over the lower portion of the Nile Valley and a lowering of the relative humidity to below even that of Dakhleh, in the heart of the Libyan Desert. Perhaps, owing to local conditions at the observing station, the weather records for Aswan (lat. N. 24° 2′ 25″) show higher monthly means for July, August, and September than Wadi Halfa (fig. 2), just within the Tropics (lat. 21° 54′ 49″). These temperatures would doubtless be too high for the upper portion of the desert subtropical zone from Luxor to Aswan, where the date culture of this zone practically ends, on account of the submergence of the narrow valley lands by the Aswan reservoir.

There is a decided step in temperature conditions between this region and the northern portion of the desert tropical zone represented by Ibrim. Scattered groves of dates appear shortly south of the Tropic of Cancer, but the heaviest culture begins about Korosko

and is at its best in Egyptian territory from there through the Ibrim district, the dry variety called "Ibrimi," from this locality, giving character to the output. These dates were in considerable repute 100 years ago, when Burckhardt passed through the valley, though later he compares them unfavorably with those of Sukkot. Burckhardt's observations on the dates of the districts he visited confirm in a very interesting way the information which was gleaned by the writer while in the Sudan about the spread of the date industry.[1] Burckhardt speaks in high terms of the dates of Sukkot and says that they are brought by the Arabs from Merowe and taken by camel caravans across the desert to that point, Dongola having but few dates, and those of poor quality. At Berber, the year following, he mentions dates as a great luxury which had to be bought from the Dongola traders. He also mentions as a landmark a single tall date tree near Shendi, the only one of its kind in that region. These statements agree perfectly with those made by the chief men of Merowe and vicinity that a hundred years ago Dongola had no dates, all of their four commercial varieties having been obtained from Sukkot.

The prevailing dry character of the dates of this zone was anticipated in the dry dates of the upper portion of the last zone from Keneh to Aswan, but is now fully in evidence. The contrast between the date output of this zone and that of the maritime subtropical zone is striking. Of the dates of the delta region, not one is a dry variety. As previously stated, only one or two are fair packing sorts. The tendency is strongly to the "rutab" or crisp (succulent) sorts, too low in sugar content to be self-preserving as they ripen. A few specimen trees of the dry types seen in the delta region were plainly not adapted to the local conditions, and the fruit matured was poor in quality.

The development of a good dry date is, beyond doubt, a matter of climatic conditions, of heat and low humidity combined. It is true that very soft, sirupy dates of the type of the Hamrawi may develop under as hot and dry conditions as those at Dakhleh and Khargeh, but their sugar content is very much higher than for similar dates in the cooler and highly humid delta. The Dongola region of highest mean temperature of any successful date region of Africa, and also of lowest relative humidity, does not produce one date variety of a clearly soft, sirupy type. Its nearest approaches, Kulma and Bentamoda, are to be classed as semidry dates. Their leading date, the Barakawi, is commended by those people because they say it is so hard that the weevils can not hurt it, and that it will keep for two years. (Pl. IV, fig. 2.)

[1] Burckhardt, J. L. Travels in Nubia. Ed. 2, 498 p., illus., 2 maps. London, 1822.

Algerian Deglet Noor trees from offshoots brought to Merowe were shown to the writer by Gov. Jackson in first fruit, and in the latter part of September the fruits were ripe and as hard as the dry dates of the country. This same tendency to become dry or "mummified" is observed in the Deglet Noor in the Coachella Valley in California in exceptionally dry, hot seasons, especially if a minimum amount of water is given them.

The preponderance of dry dates in the Nubia and Sudan portions of the Nile Valley may, then, be attributed to two general causes, namely, the general tendency of the climate to the production of dry varieties and the selection of such dry varieties as are of greatest commercial value. Such selection is on account of the readiness with which they are cured and the convenience with which they are stored and transported, their indestructible character permitting their being packed in stout bags and carried by camel caravans subject to the hardest conditions, yet always ready as an article of food without preparation.

Referring to the temperature diagrams in figure 1 and the plotted curves in figure 2, it will be seen that at Merowe and Khartum the lowest monthly means, December and January, are considerably above the line of 64.4° F., assumed to be the zero point of activity of the date tree in flowering and fruiting functions. In spite, however, of the high December and January means, the date trees of Dongola flower and are pollinated at about the usual time of dates farther north. According to Davie, "pollination takes place in February and March," practically the same months when it is practiced in Dakhleh and Khargeh, where the means of December and January are considerably below 64.4° F. That is, a continuous mean temperature for those months of several degrees above the assumed zero point does not prevent these trees from having a resting period and postponing the flowering period to about the season when it occurs in considerably cooler localities. Davie records that the fruit at Merowe ripens about seven months after pollination, or September and October, but at the time of the writer's visit to Merowe, on September 20, nearly all the dates had been gathered, the Barakawi harvest had ended practically a week previously, and much of the fruit was being marketed. These facts point strongly to the necessity of a study of date-tree activities from another standpoint than that of a mean temperature of 64.4° F. as the zero point.[1]

[1] Dr. A. E. Vinson, of the Arizona Agricultural Experiment Station (in Botanical Gazette, vol. 37, p. 324-327), describes the rate of leaf growth of two trees each of the Deglet Noor and Rhars varieties at the cooperative date garden, Tempe, Ariz., through the growing seasons of 1906 and 1907 and calls attention to the agreement of the rate of growth with the mean minimum rather than with the mean maximum temperatures of the period studied. His diagrams are, however, too much involved with the waning growth of the successive leaves as they approach maturity to make his conclusions convincing. In fact, his growth curves show a more intimate coordination with the surface-soil temperature than with any other factor.

The early maturity of all the Sudan varieties is an indication of a somewhat definite number of available heat units required to mature the crop, the high temperatures of the early part of the growing season hurrying them along more rapidly than, for example, those of Khargeh and Dakhleh. The summation of 4,708 heat units above 64.4° F. shown at Merowe for the months of May to October, inclusive, to be reduced to what the date crop has actually required should have subtracted from it the summation above 64.4° F. of the month of October and half of September, or 1,096 units, leaving 3,612. Something should be added, however, for the excessive heat of Dongola in March and April over stations farther north.

If we regard the Dongola season as beginning 6 weeks earlier, through the more rapid push of the last half of March and the month of April, we can get a 6-months' summation of heat units at the time the trees actually use them, which will be a fairer index of the crop requirements than that in Table I. For this purpose Table II has been prepared.

TABLE II.—*Mean monthly temperatures and summation of heat units above 64.4° F. for the growing period of the date at Merowe, Dongola Province, from March 15 to September 15.*

Month and days.	Mean.	Above 64.4° F.	Days.	Summation.
	°F.	°F.		
Mar. 15-31	76.82	12.42	15.5	192.51
Apr. 1-30	85.46	21.06	30	631.80
May 1-31	89.87	27.47	31	789.57
June 1-30	92.21	27.81	30	834.30
July 1-31	90.23	25.83	31	800.73
Aug. 1-31	89.33	24.93	31	772.83
Sept. 1-15	91.49	27.09	15	406.35
Mean, 7 months	87.77			
Total, 6 months (middle of March to middle of September)				4,428.09

This calculation of the summation reduces the heat units used by about 300, but still shows that the Dongola dates are produced under higher heat conditions, as well as lower humidity conditions, than any date crop of which we have record.

A review of Tables I and II shows clearly the necessity of estimating the time-heat requirements of the dates of different varieties, not arbitrarily from May to October, inclusive, as was the best that could be done with the imperfect information at hand when such studies were begun, but from some definite period in the history of the development of each variety, as exemplified by individual trees in typical localities. Atmospheric moisture, soil character, and soil moisture will be important factors to be taken into account. Probably the date of pollination is as definite a time as could be selected at which to begin the estimate of heat requirements.

FIG. 1.—A PLANTATION OF AMRI DATES NEAR THE VILLAGE OF BIRKET EL HADJI, PROPERTY OF THE OMDA OF THE VILLAGE.

FIG. 2.—DATE TREES OF AMHAT AND SIWAH VARIETIES ALTERNATING WITH CORN FIELDS IN THE RICH NILE BOTTOM LANDS NEAR BEDRASHEN, IN GIZEH PROVINCE.

FIG. 1.—A DATE GROVE, CHIEFLY OF THE SAIDY VARIETY, NEAR THE VILLAGE OF RASHIDA IN THE DAKHLEH OASIS.

The giant tree in the center is a male.

FIG. 2.—DATE TREES, CHIEFLY BARAKAWI, ALONG THE NILE IN DONGOLA PROVINCE, BELOW MEROWE, SHOWING "MOTHER AND DAUGHTER" SYSTEM OF GROWTH.

Note the sakieh used for irrigation.

DESCRIPTION OF VARIETIES.

AGLANY.

Trees of the Aglany variety are tall and have slender trunks and leaves 10 to 12 feet long, with a graceful curve at the apex. The leaf bases are 7 to 9 inches broad and about 2 inches thick, diminishing gradually to the normal size of the rib, which has a regular taper to the rather slender apex. The dorsal surface of the rib is moderately rounded, while the ventral surface presents a sharply angled ridge. The spine area is about 20 per cent of the blade length; the spines are rather heavy, tapering to a slender acute apex, 2.5 to 9 inches or even 12 inches long, passing to a thick ribbon pinna 18 to 26 inches long. The normal pinnæ at 3 to 6 feet from the base of the blade are 22 to 27 inches long and three-fourths or seven-eighths of an inch to 1⅛ inches broad. From the middle of the blade they gradually diminish in length, but are still 18 to 21 inches long at 10 feet from the base and 13 to 16 inches long at the apex. Their greatest breadth, 1¼ to 1⅜ inches, is at from 6 to 10 feet from the base. The pulvini are heavy, those on the spine and lower pinnæ being very heavy, but only slightly caudate, and there are no coalescent groups of pinnæ. The thickness of the pinnæ blades is about 0.017 to 0.018 of an inch.

The antrorse pinnæ form about 25 per cent of the whole number on the blade, the introrse and retrorse about 35 per cent each, the others being undetermined. The paired groups of pinnæ form more than half of the entire number, the triple groups rank next, and there are a few quadruple groups.

The divergence of the pinnæ from the rachis is rather slight, about 15° to 20° for the antrorse and 25° to 30° for the introrse and retrorse classes. They lie close to the blade plane, the outer half of the blade being broad, smooth, and nearly flat.

The fruit[1] is 1⅝ to 1¾ inches long, three-quarters of an inch in diameter, narrowly elliptical in outline; color, lemon yellow, curing to a dull brown. The skin is thin, the flesh three-sixteenths to one-quarter of an inch thick. These dates, when fully ripe, are very sweet and sirupy, but rich enough in sugar to enable them to be dried and packed for shipment though they are largely eaten fresh. The seeds are 1 inch long, five-sixteenths of an inch broad, rather oblong, with broadly rounded ends. The ventral furrow is deep, the germ pore being nearly central. At Salihieh, where this variety is chiefly grown, it is ripe about the first week of November.

AMHAT.

(Notes taken at Bedrashen and Abu Nemrus.)

Trees of the Amhat variety are tall (Pl. III, fig. 2) and have medium-heavy trunks and glaucous blue leaves 10½ to 13½ feet long, with bases of moderate width and the rather stout ribs strongly rounded dorsally and decidedly arched ventrally, giving unusual approach to a cylindrical cross section.[2] The spine area is 2½ to 4½ feet, the medium-heavy spines from 2 or 3 inches long below to 8 or 9 inches in the upper ones and passing to stout spike pinnæ 23 to 27 inches long. The succeeding normal pinnæ are 24 to 27 inches long, decreasing but slightly till near the apex, where they drop to 20, 17, and finally 14 inches.

The pinnæ range in width from 1¼ to 1½ inches, only a few of the apical ones dropping to five-eighths or three-fourths of an inch broad, and they are rather firm and stiff

[1] For the characters of the ripe fruit the writer is indebted to Mr. Thomas W. Brown, horticulturist of the Egyptian Ministry of Agriculture.

[2] For the system of technical descriptions used in the following pages see "Botanical Characters of the Leaves of the Date Palm Used in Distinguishing Cultivated Varieties," Bulletin 223, United States Department of Agriculture, by the writer of this bulletin.

throughout, with a thickness of 0.017 to 0.020 of an inch. The pulvini are from medium to heavy, a few being slenderly caudate and coalescent.

The diversity of the angles of the pinnæ gives a rather ragged appearance to the blade, and the position of the antrorse class keeps the valley of the blade rather narrow clear to the apex, a somewhat unusual feature. The analysis shows unusually low numbers of introrse pinnæ and a corresponding high proportion of the paired antrorse-retrorse groups.

The fruit stalks are of medium weight, about 36 to 40 inches to the fruiting head, which is 12 to 15 inches. The strands, or "shamrokh," 18 to 22 inches long, are set with fruit on the outer three-fifths of their length.

The oval fruits are 1⅜ to 1¼ inches long and about three-fourths of an inch broad, the broadest portion being a little beyond the middle.

The color is orange yellow, curing to a brownish black, the packed color being an oily black for which there is no equivalent in the color scheme. The skin is thin and the flesh sticky and of a color difficult to place in the scale, a "maroon purple" (R. XXVI)[1] much deepened being the nearest equivalent. The flavor is rich and very sweet, but rather cloying.

The seeds are about three-fourths of an inch long, five-sixteenths of an inch broad, nearly oblong, with rounded ends, the apex obtusely pointed. They are nearly cylindrical, smooth dorsally, the germ pore placed a little nearer the apex, the ventral surface somewhat corrugated, the ventral furrow narrow and shallow. Their color is very close to "auburn" (R. II).

This variety is gathered before it is fully ripe and dried somewhat in the sun, spread on palm leaves in drying yards. The dates are then tramped into huge baskets of braided date leaves, holding from an ardeb of 320 pounds to 600 or even 752 pounds. While this is a date of rather valuable qualities, certainly much superior to the Amri in flavor, it is handled in such a careless and filthy manner, which filthiness is enhanced by the stickiness of the fruit, that the whole product is a dirty, sticky mass that finds a sale among the poorer people at prices considerably below those commanded for the Siwah of the same district.

The chief area of the production of this variety is in Gizeh Province, in the districts around Bedrashen, Hauamdiyeh, and Abu Nemrus. There is also a considerable planting about Manshia, north of the Gizeh Pyramids.

AMRI.

(Notes taken at Salihieh and Birket el Hadji.)

Trees of the Amri variety (Pl. III, fig. 1) have unusually airy and feathery tops, an appearance due both to the slender, flexible rib and to the narrow pinnæ.

The leaves are 11 to 12 feet long, the rib light throughout, narrow and strongly rounded at the base and tapering to a slender apex, which becomes very thin laterally. The light ribs are counted of small value in the manufacture of crates and other material of that character.

The spine area is only about 15 inches, the spines from 2 to 6 or 7 inches long, slender and acute. They pass into soft ribbon pinnæ varying from 10 to 16 or 18 inches in length. The normal pinnæ become 22 to 23 inches long at 4 or 5 feet from the base and gradually diminish to 10 or 12 inches at the apex.

Through the middle of the blade the pinnæ reach a breadth of only seven-eighths of an inch or 1 inch, while the upper and lower ones are from one-half to three-fourths of an inch broad. Several of the lower pinnæ are somewhat "necked," as is common in Hayany, and the apical pinnæ are noticeably winged.

[1] The color references in this and the following descriptions are from Ridgway's "Color Standards and Nomenclature," Washington, D. C., 1912. Published by the author. The color cited, "maroon purple," is quoted from Ridgway's plate 26, being indicated by "R. XXVI."

The ripe fruits are 2 to 2½ inches long, 1 inch to 1¼ inches broad, nearly oblong (fig. 3), sometimes a little the broadest at slightly above the middle, rounding to a blunt and often oblique apex, with a short awnlike point. The color is "liver brown" (R. XIV) or "Hessian brown" (R. XIII), the skin thick, often loose from the flesh and thrown in coarse wrinkles. The flesh is three-eighths to five-eighths of an inch thick, coarse fibrous, with some stickiness, and with a zone of tough "rag" one-sixteenth of an inch thick next to the seed.

The seeds are large and often rough and corrugated, 1¼ to 1½ inches long, three-eighths of an inch broad, often poorly filled out at the base; the germ pore placed rather toward the base, the ventral furrow broad and shallow. The color of the seed is as near "Mars brown" (R. XV) as can be selected.

At the time of the writer's visit to Salihieh, November 8, the bulk of this crop had gone out, so the date of ripening may be set at about November 1.

This date has considerable sweetness, but the flavor is coarse and common. Its large size and fine appearance, along with its good packing qualities, can alone account for the popularity of the variety.

The production of the Amri is brought to the greatest perfection in the regions of Korain and Salihieh, on the sandy borderland between the delta and the desert, and is grown in small numbers under similar conditions about Merg and Birket el Hadji, which seems to be about its southern range. It probably ranks as the most important export variety of Egypt, though data in this regard are very meager. The best packs seen by the writer were in the regions above mentioned, where the pebble-floored drying yards secured some degree of cleanliness, and where the reflected heat insured a more nearly perfect curing of the dates than is obtained under other conditions.

FIG. 3.—Outlines of the Amri date from the omda's garden, Salihieh, Lower Egypt. (Natural size.)

In the gardens of this section the dates are packed in boxes of light pine boards, which are cut and put together in small factories in the villages. These boxes were not exactly uniform in size, but hold from 40 to 50 pounds each, according to how closely they are packed. The most that could be learned about the market was that the bulk of the crop is shipped from Alexandria to points in southern Europe. This date is found rather rarely in the market stalls of Cairo.

BARAKAWI.[1]

(Sukkoti, Ibrimi, Ibrihimi.[2])

The leaves of the Barakawi variety are 9 to 10 feet long, with a graceful feathery taper. The spine area is 18 to 24 inches, the spines slender and acute, the lower ones weak and short, but the higher ones become 2½ to 4 inches long, passing into ribbon

[1] The original name of this variety, as obtained from Sukkot by the Dongola people, is undoubtedly Barakawi, which in the Arabic of that province signifies "blessed," as ascertained by Mr. Thomas W. Brown, of Gizeh. Some of the chief men of the province, however, write the name in a form which must be transliterated "Birkawi," adjective for the noun "birka," a pond or pool. Originating in Sukkot, offshoots of the variety were carried down the river to below Wadi Halfa, where they were given the name Sukkoti. After a shipping trade in these dates from the Ibrim region below Halfa was carried on to points down the river, they took the name Ibrimi, and now the Barakawi dates going to Cairo from Dongola Province are sold under the name Ibrimi.

[2] Popenoe, in "Date Growing in the Old and New World," gives this variety as "Ibrihimi, vulgarly Ibrimi, Abraham's date," being evidently unacquainted with the geographic origin of the name Ibrimi.

pinnæ 10 to 15 inches long, only three-eighths to one-half an inch broad, soft, thin, and acute.

The normal pinnæ are 12 to 16 inches long, three-fourths of an inch to 1 inch broad, but the blade tapers with a feathery grace toward the apex where the pinnæ are but 6 to 9 inches long and one-half to five-eighths of an inch wide. The pinnæ are very smooth in their arrangement, falling nearly into two ranks, with a divergence from the plane of only 10° to 30°, and from the axis of 30° to 45°. The groups fall into twos, threes, and fours, but the difference in the angles formed by the antrorse, introrse, and retrorse pinnæ is not very pronounced, and toward the apex many of the pinnæ are difficult to place.

The pulvini are inconspicuous and none caudate.

The fruits are of the dry type, 2 to 2¼ inches long, three-fourths of an inch broad at the base, tapering acuminately to a small obtuse apex. They are usually oblique and unsymmetrical, often slightly curved (Pl. V). The surface is broken by fine, branching, longitudinal furrows, but is more nearly smooth toward the base. The color of the apical half or two-thirds is "chestnut brown" (R. XIV) or in some cases more nearly "bay" (R. II). There is a faint lavender bloom. The basal portion of the fruit is usually a shade between "honey yellow" and "Isabella color" (R. XXX).

The firm dry flesh is three-sixteenths of an inch thick, having an outer zone sometimes the color of the exterior, the inner portion being pale "cream color" (R. XVI) or "cartridge buff" (R. XXX). The flavor is moderately sweet, wheaty, with a suggestion of a fruity acid, and no hint of astringency. With those who are fond of the appetizing flavor of the best dry dates without the cloying richness of the sirupy type, this will find a place among the three or four best varieties. The seeds are small for the size of the fruit, about 1½ inches long, one-fourth to five-sixteenths of an inch broad, nearly oblong, smooth, with a broadly rounded apex. The small germ pore is placed at about three-fifths of the seed length from the base, the ventral furrow being narrow but rather deep. In color they are "snuff brown" (R. XXIX) in the darker parts, fading toward "cream buff" (R. XXX) in the lighter portions.

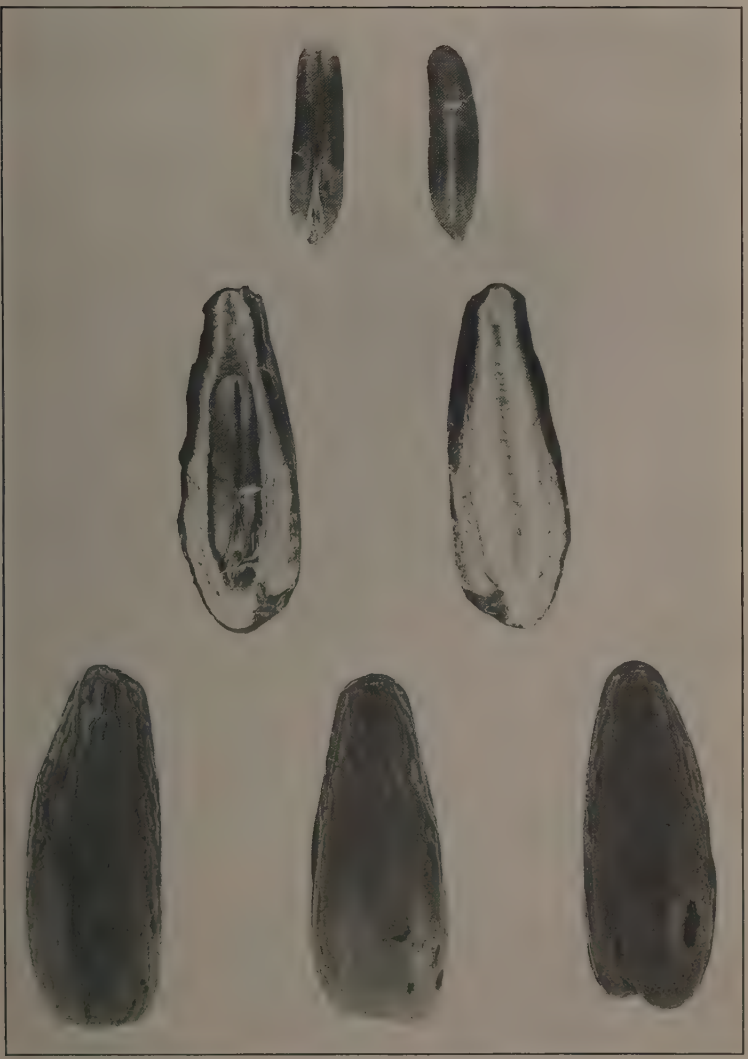
This is the great commercial date of the Dongola Province, and it is claimed, as for the three other varieties, that it was brought from the Sukkot country many years ago, a claim fully sustained by Burckhardt's account.

The fruit is reputed to possess the best keeping qualities of any variety known in Nubia or the Sudan. The natives say that it will keep for two years, and that it is so hard that the weevils do not get into it. It is in great demand among the nomads, who come in from as far as Kordofan to purchase these dates at the Dongola market towns. The price as given by Davie[1] is 72 to 96 piasters per ardeb of 320 pounds, equivalent to $1.12½ to $1.50 per 100 pounds.

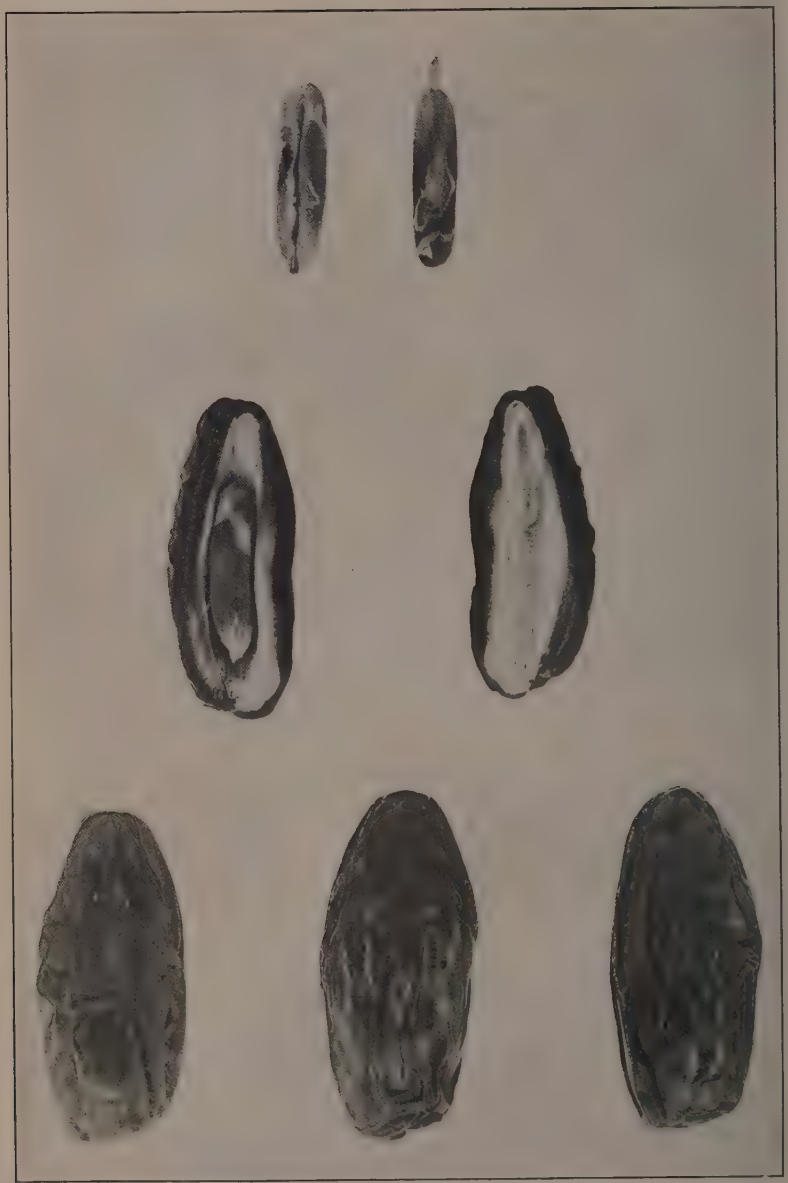
Col. H. W. Jackson, Governor of Dongola Province, states that about one-third of the output of this date now goes to Egypt; also that they are much sought after by the pilgrims to Mecca, their fine keeping and transporting qualities, as well as their excellence as a food, making them very desirable for such a long journey. One of the prominent sheiks told the writer that these dates are sold in Egypt under the name Ibrimi.

The region of the chief production of this date is the great bend of the Nile, a stretch of about 150 miles lying between the third and fourth cataracts. For the greater part the bottoms are very narrow, scarcely more than garden patches, and often the rugged sandstone bluffs, crowned with the ruins of ancient Roman fortresses or the more recent native retreats in time of river raids, rise abruptly from the river bank. There are no irrigation canals in the entire province, and with the exception of some small flood areas and the infiltration received by trees near the river banks, the date trees are all irrigated by means of rude geared wheels of acacia wood (sakieh) turned by

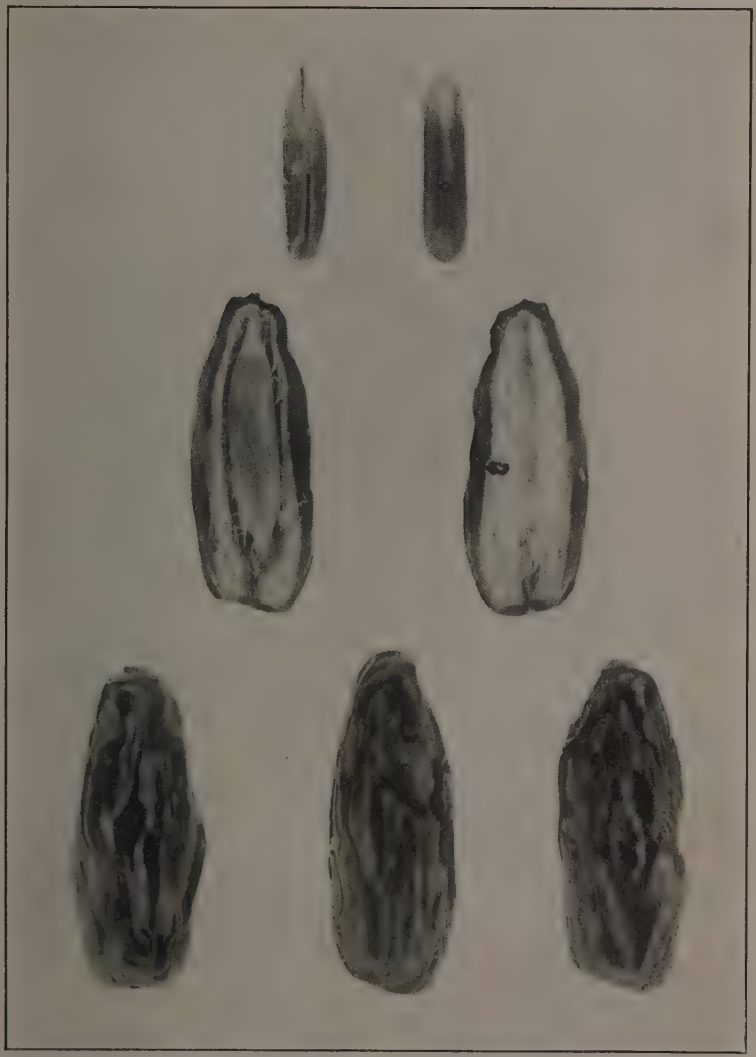
[1] Unpublished manuscript, "The Date Palm," by W. A. Davie, Inspector of Agriculture Khartum, May, 1911; courtesy of the Director of Agriculture and Forestry, Sudan Government.



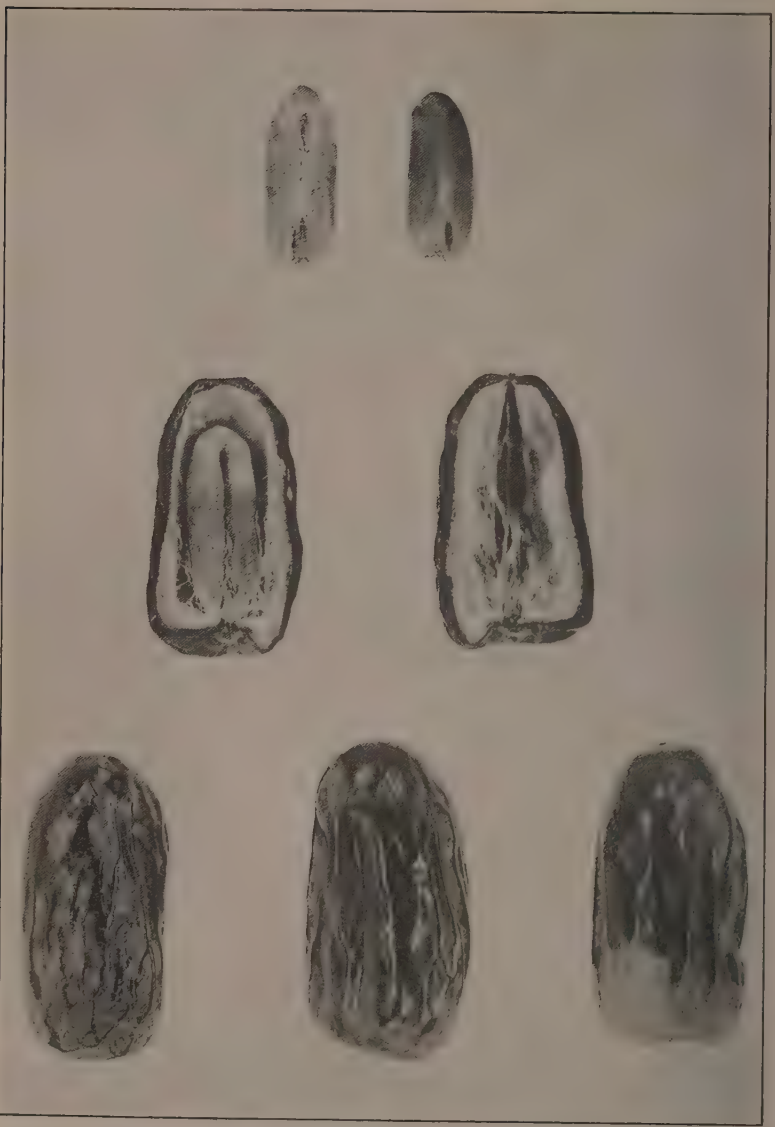
SAMPLES OF THE BARAKAWI DATE, THE CHIEF COMMERCIAL VARIETY OF THE SUDAN; FROM MEROWE, BUT KNOWN AS IBRIMI IN THE EGYPTIAN MARKETS. (NATURAL SIZE.)



SAMPLES OF BENTAMODA, THE CHOICEST VARIETY OF SUKKOT AND DONGOLA DATES, FROM MEROWE. (NATURAL SIZE.)



SAMPLES OF BARTAMODA DATES FROM ASWAN, WHERE BUT FEW TREES ARE KNOWN; THE SAME FRUIT AS BENTAMODA. (NATURAL SIZE.)



SAMPLES OF CORRAGIA, A MINOR VARIETY OF DATE FROM MEROWE, SUDAN. (NATURAL SIZE.)

bullocks, which lift the water by means of an endless chain of earthen jars set on heavy ropes. (Pl. IV, fig. 2.) Where the lands are the best and the culture the most intensive the sakiehs are often not more than 100 feet apart, and the moaning creak of a score of these along the river bank on a hot tropical night is one of the memories that will abide longest with the visitor to Dongola.

Except in the newest plantations, there is little regularity in the setting of these date trees and the practice of allowing from three to seven or eight "daughter" trees, offshoots from the "mother" tree, to grow up around it, inclined at various angles from the perpendicular, gives to these Dongola date plantations a weird and tropical picturesqueness, which contrasts strongly with the straight-bodied, formal appearance of the groves seen about Merg or Bedrashen.

Either there is an appreciation of the fact that in this region of dry air and intense heat a greater insulation of the growing center is needed, or perhaps the temptation to remove leaf material to sell is not so great; at any rate, the tops of the Dongola date trees are left much heavier than in Lower Egypt, and the leaves are not cut so closely at the base.

The Dongola people are apparently very well satisfied with their Barakawi industry and are offering no offshoots for sale, but are planting new groves as fast as they can get the material.

The writer was informed that there is also a considerable production of this variety, under the name "Ibrimi," in Berber Province, which is the uppermost date-producing region of the Nile Valley, including the fourth and fifth cataracts; for while there are many date trees about Khartum, the fruit is hardly produced in commercial quantities.

In the reaches of the Nile Valley, between Wady Halfa and Korosko, there are narrow stretches of alluvial land and islands which, together, permit the cultivation of many thousands of date trees, of which this variety, under the name "Ibrimi," is the chief. An important section of the valley is on some maps designated as Wady Ibrim, to which an ancient ruin known as the Kasr Ibrim doubtless gave the name, and which is now represented by a modern native village of the usual squalid type. The product of this section reaches the markets of Lower Egypt under the name "Ibrimi" and leads to the inclusion of the Barakawi dates from Dongola under the same name. As there is a great variation in size and appearance among the dates marketed as "Ibrimi" in Cairo, there is good ground for the suspicion that the crop from a good many seedling trees bearing fruit closely resembling the original variety is marketed under that name.

BENTAMODA.

(Betamoda, Bartamoda.)

Trees of the Bentamoda variety have moderately heavy trunks and gracefully curved leaves 9 to 12 feet long, with light, slender ribs and narrow bases. The spine area is very short, the slender needlelike spines being from 1 inch long below to 5 or 6 inches long where they pass to the narrow, grassy ribbon pinnæ. The normal pinnæ range in length from 12 or 16 inches to 18 or rarely 21 inches at a little beyond the middle of the blade, holding 12 to 16 inches to near the apex, where they shorten abruptly to a range of 7 to 10 inches.

The pinnæ are narrow throughout, seven-eighths of an inch to 1 inch broad, rarely exceeding 1⅛ or 1¼ inches in the wider ones. Their texture is soft and grasslike, with a thickness of 0.011 to 0.014 of an inch. The pulvini are light, in some cases slightly caudate, but with no groups coalescent. At the base of the blade the pinnæ have a light axial divergence and a strong divergence from the blade plane, forming a narrow, close valley, which opens out toward the middle of the blade, where the pinnæ are at about 27° to 30° from the blade plane, giving a rather smooth uniform leaf toward the apex. The general color is rather light green with a thin waxy bloom.

The fruit in ripening presents a very beautiful appearance, the bunches being heavy on long strands (shamrokh). The half-ripe fruit is about 2¼ inches long, often oblique, a little curved, and with a peculiar long-pointed apex (Pl. VI). The color is a mingling of "apricot orange" (R. XIV) with "ochraceous orange" (R. XV). The flesh is thick, the interior of which is satiny white. In ripening, the fruit becomes considerably reduced in size, and is about 2 inches long and seven-eighths of an inch to 1 inch broad, with the skin softly wrinkled and an appearance of bloom. The color is now a shiny "Brussels brown" (R. III). The oblique form and long point are still well retained (fig. 4). The flesh is soft, but not sticky, very rich and sweet, with a distinctive flavor, which places it in a high class among dates. The smooth oblong seed is narrow and rather delicate for the size of the fruit, being 1¼ to 1 5/16 inches long, five-sixteenths of an inch broad, rounding about equally and obtusely at either end, but the apex is often apiculate. The germ pore is placed about two-fifths of the seed length from the apex, the ventral furrow being shallow and narrow. The color of the seed is close to "Sayal brown" (R. XXIX).

Samples of this fruit brought from Merowe and examined in Washington on May 20 of the following year, though still in perfect condition, did not possess quite the high flavor of the recently matured fruit.

This variety is considered by the English residents of the Dongola and Halfa provinces to be the finest date of dessert quality in the Sudan. It is nowhere found in commercial quantities, and the possession of a few trees is regarded as rather a mark of wealth and distinction, the fruit being kept to offer to guests or sent as presents. The gift of an offshoot from this variety is a mark of especial favor or courtesy. Davie states that this variety "can be treated as a soft or a dry date," also that "an ardeb (300 to 320 pounds) will fetch as much as 192 piasters ($9.62 in United States money). There is not much trade in this variety, however, as the quantity is limited." It is claimed to be one of the four varieties originally obtained by the Dongola people from the Sukkot region, where it is to be found to-day in greater numbers than in Dongola.

FIG. 4.—Outlines of the Bentamoda date in fresh condition, from Merowe, Dongola Province, Sudan. (Natural size.)

A very interesting question of synonymy arises from the fact that among samples of dates collected from near Aswan for Mr. Thomas Brown, horticulturist, of the Egyptian Ministry of Agriculture, was one of a variety called "Bartamoda," which upon careful comparison could not be distinguished from the sample of Bentamoda, which the writer brought from Merowe. Also, in October, 1911, Mr. A. Aaronsohn, acting as agent for Mr. Fairchild, purchased at Aswan, among others, 10 offshoots of "Bartamoda" (under S. P. I. No. 32720).

As offshoots have been brought down the river from Sukkot to the Aswan region for many years, it would have been probable that so fine a variety as the Bentamoda would be among them, and with the carelessness of these people about names, which often pass by word of mouth, the discrepancy in this case is not surprising. As to the meaning of the name as used in Dongola, the writer could get no satisfactory explanation. To the question whether it was from "bint" or "bent," daughter or girl, they insisted that it was neither.

A special trip to Aswan was made early in February, 1914, for the purpose of studying on the ground the question of the identity of the dates known under these two names. A close examination was made of the few trees known as "Bartamoda" to be found near the village, and through the courtesy of the omda samples of the fruit were obtained, so as to settle beyond question the identity of the two (Pl. VII). A very intelligent native gardener, familiar with the trade in date offshoots from the Sudan region, also emphatically testifies that Bentamoda and "Bartamoda" are the same date.

BINT AISCHA.

(Notes taken in Gizeh Garden, Nov. 12, 1913.)

The trees of the Bint Aischa variety are the smallest in the park collection, though the leaves nearly equal those of Samany in length. They are 14 to 15 feet long, with rather slender ribs strongly rounded dorsally and decidedly arched ventrally. The leaves have a distinctly glaucous-green color and are heavily coated with waxy bloom. The spine area is from 2 to 3 feet, the slender, acute spines from one-half inch to 5 or 6 and up to 9 inches in length. They are followed by ribbon pinnæ 2 to 3 feet long, one-half inch to 1 inch broad, and so soft and flexible as to be quite pendulous.

The normal pinnæ are 24 to 28 inches long, 1 to 1½ inches broad, diminishing evenly to 14 or 16 inches long at the apex. The lateral faces of the ribs and attachments of the pinnæ are rather narrow, the pulvini light. Toward the apex of the blade many of the pinnæ have the proximal fold broadened into a wing. The thickness of the pinnæ is 0.017 to 0.018 of an inch.

The orange-colored fruitstalks are of medium size.

The fruits are 1½ to 2 inches long, about 1 inch broad, oval, or broadest at two-fifths of the length from the base, rounding rather abruptly to an obtuse apex. The hard ripe color is near to "Bordeaux" (R. XII), with a conspicuous pale lilac bloom, lighter than "mauvette" (R. XXV). As ripening advances the color deepens to "burnt lake" (R. XII), and from that to nearly black. The outer flesh is then near "raisin black" (R. XLIV), whitening toward the center. The skin then slips readily from the flesh, which is surrounded by a thin, sirupy layer.

The rather small seeds, 1 inch long and one-quarter of an inch broad, are smooth and tapered slightly toward the base. Their color is nearest to "auburn" (R. II). The germ pore is generally one-third of the seed length from the base, the ventral furrow being light and shallow.

The flavor is rich and sweet, and this is a deservedly popular little date. It is quite widely disseminated from Rosetta to Merg, but is nowhere planted as a leading variety.

CORRAGIA.

The Corragia date is a Dongola variety known only from ripe samples obtained at Merowe, on September 24.

The fruits are 1⅜ to 1¾ inches long, about 1 inch broad, with square blocky base and body diminishing slightly to a broadly rounded apex (Pl. VIII). The rather thick skin is generally closely adherent and the surface thrown in short, coarse reticulations.

The color is rather deeper than "chestnut" (R. II) with a short basal area approaching "mikado brown" (R. XXIX), and there is a pale lavender bloom.

The thin semidry flesh is spongy, with a good deal of tough fiber within. It is "cream buff" (R. XXX) in color. The flavor is sweetish, but lacking in quality. The large smooth stone is 1 inch long, a little more than three-eighths of an inch broad, with broadly rounded ends. The small germ pore is slightly apical, the ventral furrow moderately broad and deep; color, dull "cinnamon brown" (R. XV), shading to "chamois" (R. XXX) at the base. This is a date of fine appearance, which is belied by its thin flesh and third-rate quality.

FALIG.

The Falig date is a variety mentioned by Beadnell[1] as growing in the Khargeh Oasis but was seen by the writer only at Rashida village, in Dakhleh, where it was served as a dessert fruit. A complete description was not obtained.

The fruits are large, having a length of about 2½ inches, long elliptical in outline, color a rich waxy yellow, flesh very rich and sweet, but so soft and sirupy as to be difficult to eat. It is said to keep but a short time.

[1] Beadnell, H. J. L. An Egyptian Oasis . . . p. 212–223, 2 pl. London, 1909.

GONDEILA.

(Notes taken at Merowe, Dongola Province, the Sudan, in September, 1913.)

The Gondeila date tree has beautiful, long, tapering leaves with their pinnæ very regular in arrangement, forming a blade nearly open and flat. In general appearance it reminds one of Arechti more than of any other variety. The leaves are 12 feet or more in length, the rib moderately heavy, with a graceful taper, the base firm and heavy, strongly rounded dorsally, but little arched ventrally. The spine area varies from 2½ to 3 feet; the spines, usually placed singly, are rather weak and scattered. They pass into ribbon pinnæ, 22 to 24 inches long and one-half to five-eighths of an inch broad. Above these the normal pinnæ are 18 to 22 inches long, 1½ to 1¼ inches broad, but diminishing toward the apex to 17 or 18 inches in length and one-half to five-eighths of an inch broad. They have a very graceful appearance, are soft in texture, and have no acuteness at the tip.

The pulvini are small and inconspicuous; none are caudate.

The pinnæ form angles of 10° to 15° with the plane of the blade and of 30° to 45° with the axis of the leaf. In grouping, the pinnæ run rather uniformly antrorse-retrorse and antrorse - introrse - retrorse, with no higher groups.

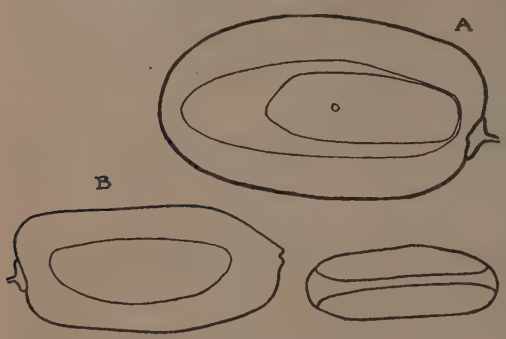


FIG. 5.—Outlines of the Gondeila date from Merowe, Dongola Province, Sudan: *A*, Freshly ripe; *B*, cured. (Natural size.)

The fruit stalks (Arabic "sobata") are very heavy, 2¼ inches broad, rigid, 40 to 43 inches long to the head. The fruiting head is 6 to 8 inches long; the strands or "shamrokh" are short, coarse, angled, sprangly, or standing out at strong angles from the heads; all parts are a dull pale orange color.

The fruit, borne on the outer half of the shamrokh, is 1¾ to 2 inches long in the partly ripe stage, smooth, oval (fig. 5), in color "antimony yellow" (R. XV), the flesh and inner surface being satiny white. As ripening proceeds, the fruit colors to amber brown at the tip and becomes softly wrinkled, the ripening advancing toward the base, which remains a dull yellow when fully ripe. The flesh is then pale-amber colored, a little granular, rich, and sugary.

This is decidedly a fine dry date, the equal of any we have from Algeria. At Merowe on September 21 the last of the fruit had just been cut; the first was ripe 14 days earlier.

Trees of this variety are grown only in small numbers, and the fruit is usually kept for presents or to offer to guests. It reaches Cairo only on special orders.

An ardeb (320 pounds) is priced at 154 piasters (about $2.40) per 100 pounds.

Inspector of Agriculture W. A. Davie quotes an ardeb of "Gondela" at 100 to 120 piasters (equivalent to $1.50 to $1.87) per 100 pounds.

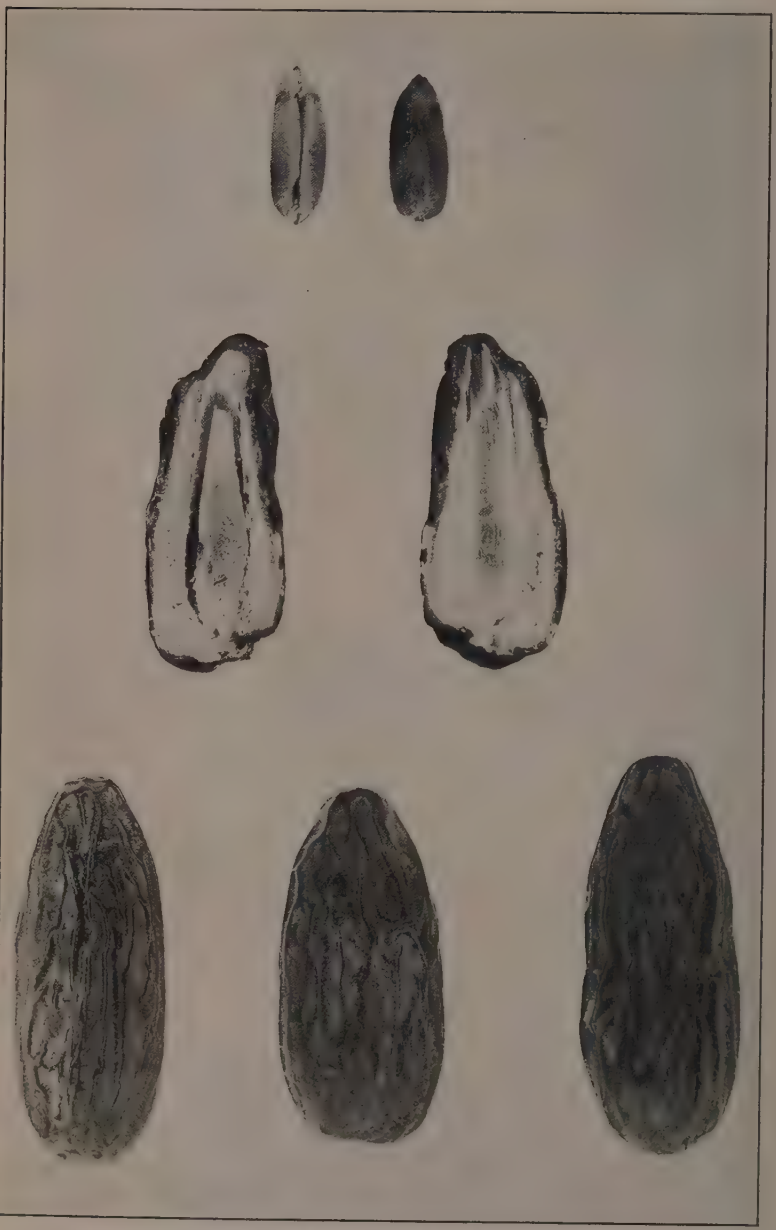
The Gondeila was given by the leading men at Merowe and by Col. H. W. Jackson, Governor of the province, as one of their four chief varieties, ranking next to Barakawi in numbers and importance.

With others this variety is said to have been brought originally from the Sukkot country, which the Dongola people say possessed the date first. Various authorities agree that this date can now be found in small numbers in the region about Aswan, to which country many date offshoots have been brought down the river from Sukkot. A number of trees said to be of this variety were shown to the writer at Aswan in February, 1914.

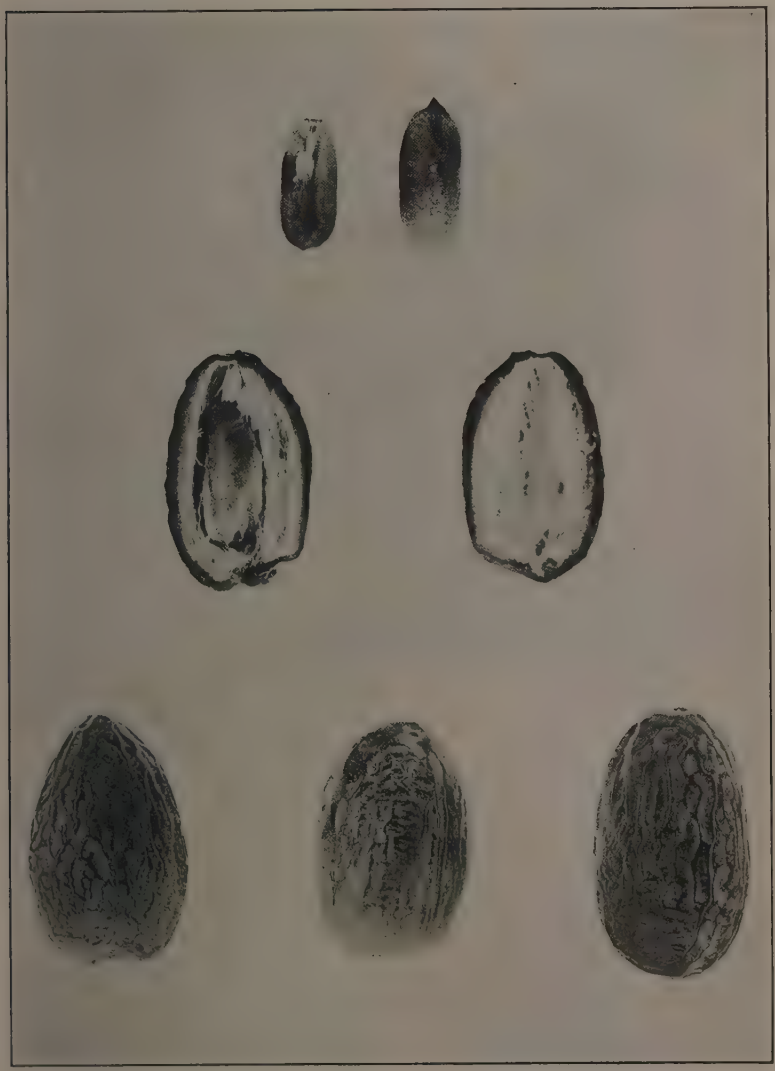
FIG. 1.—A YOUNG PLANTATION OF HAYANY DATES IN THE DRIFTING SAND NEAR THE MEDITERRANEAN COAST ABOVE RAMLEH.

FIG. 2.—A YOUNG HAYANY DATE TREE NEAR RAMLEH.

Showing how the fruitstalks are lashed to the ribs of the leaves to keep the bunch from thrashing in the strong winds from the Mediterranean.



SAMPLES OF JAOW ISWOD, A MINOR VARIETY OF DATE FROM NEAR MEROWE, SUDAN. (NATURAL SIZE.)



SAMPLES OF JAOW OBAID, A MINOR VARIETY OF DATE FROM NEAR MEROWE, SUDAN.
(NATURAL SIZE.)

SAMPLES OF KOSHA, THE LEAST KNOWN OF THE FOUR CHIEF VARIETIES OF DATE OF DONGOLA PROVINCE, FROM NEAR MEROWE, SUDAN. (NATURAL SIZE.)

HAMRAWI.

The Hamrawi date is a variety of secondary importance in the Khargeh and Dakhleh Oases, and only a small number of these trees are grown. At El Khargeh it was mentioned that especially fine "agwa" is prepared from them, packed in earthen jars.

The leaves of this variety are long, with light flexible ribs and rather narrow bases strongly rounded dorsally, and dark colored, as though partaking of the dark red naturė shown in the fruit. The spine area is long, one-third to two-fifths of the blade length, the spines short, light, and weak. They pass into very narrow ribbon pinnæ. The normal pinnæ are 18 to 24 inches long, 1¼ to 1½ inches broad, rather soft in texture. The fruit stalk is short, heavy, and erect, the strands short, the bunch very heavy and compact.

The fruit is about 2 inches long, 1½ inches broad, oblong, with square blocky base and rounding abruptly to a broad obtuse apex. The ripening fruit is nearest to a brilliant "carmine" (R. I), but ripens to a dull purplish color, nearly black. The dark flesh is very soft and sirupy, richly sweet, keeping but a short time after it is fully ripe. The seed is rather small.

A date grown in the vicinity of Bedrashen is known by this name, and of it the fellahin give a similar description, but the writer was unable to see it in fruit and is not certain that it is identical.

HAYANY.

(Notes taken in the vicinity of Merg and Birket el Hadji.)

The Hayany date is a tall-growing variety, but its trunks are usually more slender than those of most of the Egyptian dates (Pl. II, fig. 1). The leaves are usually about 12 feet long and may reach 14 or 15 feet under conditions of abundant moisture and luxuriant growth. The tops are always airy and graceful in appearance, though the rib is moderately strong and has taper enough to give a graceful curve at the tip (Pl. IX, fig. 1). With the free growth induced by abundant moisture, the leaves may curve strongly outward and downward, even to an appearance of drooping. These leaves have an unusually long petiole, or clear space, between the fibrous sheath and the first spines, which sometimes amounts to 15 or 18 inches. The base is broad and thin, narrowing abruptly to a moderate-sized rib. The spine area is about 30 inches, and the slender, acute spines range in length from 1 inch for the lowest to 7 or 8 inches where they pass into the strikingly long narrow ribbon pinnæ, which may be 24 to 36 inches or more in length, while they are only one-half or three-fourths of an inch wide. From these the pinnæ diminish in length and increase in width until at 9 or 10 feet from the base they are 18 or 20 inches long and 1⅜ to 1½ inches broad, rounding off the end of the blade with a length of 14 to 16 inches. In the lower portion of the rib the lateral faces are narrow, but they become quite broad at from 8 to 10 feet. The lower pinnæ and some of the upper spines are contracted near the base into an oval solid "neck" from half an inch to 2 inches in length. While this may occur to a limited extent in some other varieties, it is a character so far always found occurring in the Hayany. The pinnæ are placed so as to form a rather smooth open blade, and the open spacing of the long lower pinnæ gives to these tops an airy lightness that is very pleasing.

The orange-colored fruit stalks are 3 to 4 feet long, of medium weight, and rather flattened in cross section. The strands (shamrokh) are of medium length and weight, the fruit being borne on their outer half.

The compact bunches of brilliantly colored fruit, hanging like huge tassels below the vase-shaped crown, make a grove of these trees a very striking sight. In the coast region the lashing of the fruit stalks to the bases of adjacent leaves to prevent the thrashing of the bunch in the gales is a cultural practice which is illustrated in Plate IX, figure 2. The fruits are 2 to 2½ inches long and 1 to 1¼ inches broad, the broadest portion being usually a little below the middle; some fruits are often a little

curved and unsymmetrical. They taper gradually toward the broadly rounded apex (fig. 6).

The color of the fruit, as it is gathered, hard ripe, is dull "carmine" or near to "Nopal red," with blotches of "ox-blood red" (all R. I). The flesh is then nearly white, brittle, juicy, sweet, with considerable astringency. In ripening, the color of the fruit drops to a shade close to "Hay's maroon" (R. XIII) and to a dull unattractive shade, as near "dull purplish black" (R. L) as anything.

In the ripe fruit the rather thick smooth skin is easily slipped off and between it and the rather soft outer flesh is a thin sirupy layer. The outer flesh is of a "tawny olive" color (R. XXIX), with a firmer, slightly fibrous interior of "colonial buff" color (R. XXX). The whole thickness of the flesh is about one-fourth of an inch. The flavor is moderately sweet, not cloying, but lacking in distinctive quality or "bouquet."

The seed is large, 1¼ to 1⅜ inches long, three-eighths of an inch broad, oblong or slightly wedge shaped, with broadly rounded ends, sometimes slightly recurved. The ventral furrow is broad and deep. In most specimens the germ pore is about three-eighths of an inch from the base, but in some seeds it is central. An examination of the fruit of individual trees would be needed to show the extent of these variations. The color of the seed varies from "wood brown" or "buffy brown" (R. XL) to near "antique brown" (R. III).

As well as the writer can judge from memory of more than a year, the flavor of these Egyptian Hayany dates is not as rich and sweet as those of the same variety grown under the name of "Birket el Haggi" in the heavier soil and under the hotter sun of the Cooperative Date Garden of Tempe, Ariz. The enormous quantities of this date gathered in the unripe stage and consumed in Egypt by people of all classes is undoubtedly the result of a taste for which, as yet, the American people have developed no equivalent. The great region of the Hayany date is that of the coastal dunes and sandy delta land from Alexandria through Ramleh and Edku around to the lands bordering the Nile below Rosetta. The second region is the border land between the delta proper and the desert, represented by Birket el Hadji, Merg, Korain, Fakus, and Salihieh. There are a few small districts bordering the desert west of Cairo where this variety is growing, and new plantings are being made above the Pyramids. The latter regions being much hotter and earlier, the crop ripens there first, and fruit from some of these points was brought into the Alexandria markets on September 2. The distribution of the fruit seems to be pretty general among the smaller towns, as well as the cities, and the heavy production is handled with very little waste. By the time the earlier regions are cleared up the crop from the coast region begins to move. The first Hayany dates from the coast were noticed in Cairo on November 7, and they continued to come in for about 30 days.

The Zagloul and the Samany varieties came in with the Hayany in the latter part of the season, and the Samany continued to appear for about 10 days after all the Hayany fruit had gone; in fact, until the shortening supply was taken by the Alexandria market. At Korain, a small proportion of the Hayany dates are made into "agwa." After being allowed to become fully ripe the skins are slipped off and the seeds removed, after which the fruit is spread in the sun and dried for a few hours. They are then kneaded and worked over several times until the mass becomes a smooth, homogeneous paste, which is then packed into earthen jars and tightly sealed.

The Hayany fruits seen in the markets of Alexandria and Cairo, as well as upon the trees at Ramleh, Edku, Rashid, Merg, and Birket el Hadji, showed marked differences in size and form. While the general type is rather constant after allowing for variations due to the different qualities of soil and amount of water received, there remain variations too great for such explanation. It is more than probable that a good many seedling trees which have appeared from time to time bearing a close

resemblance to their Hayany parent, along with their offshoots, have been incorporated under the name of Hayany and that now it would be impossible to always distinguish the original type from them.

The earliest introduction of this variety into the United States was through Mr. David Fairchild. The shipment was from Alexandria in the spring of 1901. Two offshoots with this name, under S. P. I. No. 6438, were planted in the Cooperative Date Garden at Tempe, Ariz. Of the same shipment one tree, labeled "Dakar Majahel," S. P. I. No. 6442, was very tardy in flowering, but finally proved to be Hayany or a near equivalent. Of a shipment of offshoots secured through Mr. Fairchild from Mr. Em. C. Zervudachi, in October, 1901, six trees were labeled "Birket el Haggi" and were planted at Tempe, under S. P. I. No. 7635. Three other trees of the same lot, from which the labels had been lost, were planted without S. P. I. numbers and as soon as they fruited were identified by the writer as being the same as those under No. 7635.

Studies made by the writer from 1909 to 1912 established clearly the identity of these "Birket el Haggi" trees with the trees labeled Hayany, and probably also of the No. 6442, though its very tardy fruiting is not characteristic of the variety. As the variety has been a vigorous grower, prolific in offshoots, and productive of a fruit which, if not of the highest quality, contains more sugar than it develops in Egypt, it has been very popular with the people of the Salt River Valley. It soon attracted rather widespread notice and has been more highly indorsed by the staff of the Arizona experiment station as a variety likely to be more profitable under their conditions than any other date tested in the Tempe Garden. All this exploiting has been under the name of "Birket el Haggi," frequently shortened to "Birket" as more convenient and euphonious. It was natural, then, to wish to learn not only the correct name of this date, but its home in Egypt and under what conditions it grows to the best advantage. The only published reference to the "Birket el Haggi" as an Egyptian variety is in the paper by Delchevalerie,[1] a former gardener of the khedive, who described it as a very rare variety "sweet and sugary and of a reddish color," and called it "the earliest fruiting date tree in all Egypt," giving fruits from the second year of planting. Repeated visits by the writer to the villages of Merg and Birket el Hadji, near the shores of the old "Pool of the Pilgrims," brought out the fact that they have no date variety called "Birket el Haggi," but that the early-ripening Hayany reach the Cairo market under this local name, as we in America speak of "Chautauqua grapes" or "Riverside oranges." That in a foreign country and with a foreign tongue such a local designation should be mistaken for a varietal name is easily understood. Delchevalerie's description of "Birket el Haggi" is meager in details, but corresponds well with Hayany, though his account of Hayany in the same publication is wholly

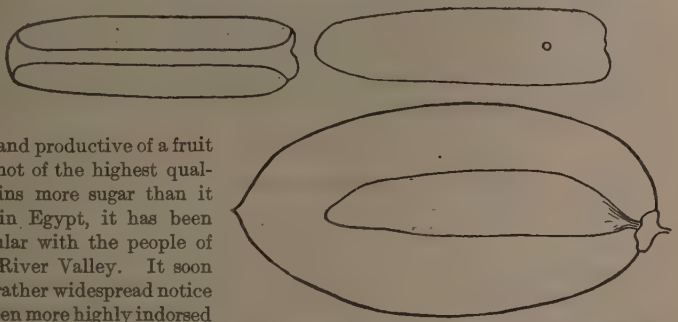


FIG. 6.—Outlines of the Hayany date in "rutab" (fresh) condition, seen in the market of Merg, December 7, 1913; shipped from Alexandria, Egypt. (Natural size.)

[1] Delchevalerie, G. L'arbre national des Égyptiens. Le dattier. Sa description, son histoire, sa culture, sa multiplication et son emploi dans les arts, l'industrie, la médecine et l'économie domestique. *In* Bul. Féd. Soc. Hort. Belgique, 1871, p. 170, 1872.

in error. How he should have overlooked the real Hayany, the most numerous and popular date in the Egyptian delta, is difficult to understand.

The essential points of the discussion are that there is no such date variety as "Birket el Haggi" and that the trees received from Mr. Zervudachi under that name and planted in the Tempe Garden under S. P. I. No. 7635 are Hayany, identical with those of the earlier importation by Mr. Fairchild under S. P. I. No. 6438.

JAOW ISWOD.

A Dongola variety known only from samples of the fruits, which were procured from near Merowe in a ripe condition on September 24.

The fruit is oblique and unsymmetrical, 2¼ to 2½ inches long, seven-eighths of an inch to 1 inch broad, the broadest portion being slightly above the base, from which it tapers granually to a rather blunt apex (Pl. X). The thick skin is closely adherent, coarsely wrinkled longitudinally, with some smaller cross reticulations. The basal portion is colored "carob brown" (R. XIV), with the apical portions more nearly "chestnut" (R. II).

The semidry flesh is about one-fourth of an inch thick in the thickest portions and is "cream buff" (R. XXX) in color. The sweetish flavor is suggestive of dried sweet apples. In keeping qualities this variety seems about perfect. The oblong seed is about seven-eighths of an inch long, five-sixteenths of an inch broad, somewhat flattened, broadly rounded at either end, the germ pore rather nearer the apex, the ventral furrow narrow and deep; color near to "tawny olive" (R. XXIX), shading to "clay color" (R. XXIX).

JAOW OBIAD.

A Dongola variety of the dry type known only from samples of the ripe fruit, which were procured at Merowe on September 24.

Fruits broadly ovate, somewhat oblique and unsymmetrical, 1¼ to 1½ inches long, three-fourths to seven-eighths of an inch broad, the shining surface being broken by well-marked but rather fine reticulations, the basal portion sometimes smooth (Pl. XI). The color is difficult to place, owing to a translucence, but may be described as between "chestnut" and "burnt sienna" (R. II), or sometimes more nearly "amber brown" (R. III), with the basal one-third often close to "honey yellow" or "chamois" (R. XXX). Many of the fruits show a faint lavender bloom.

The firm flesh, one-eighth of an inch thick, is "cream buff" (R. XXX) in color, with an agreeable flavor of honey wafers and no suggestion of astringency.

The oblong seeds are three-fourths of an inch long, three-eighths of an inch broad, nearly smooth, the ends broadly rounded, the apex often apiculate. The germ pore is placed slightly apically and the ventral furrow is narrow and rather deep. The color may be called a dull "snuff brown" (R. XXIX), with the basal portion "chamois" or "cream buff" (R. XXX).

Examined June 1, or more than 8 months from ripening, these fruits were found in perfect condition.

KOBI.

One of the latest dates to come to the Cairo market from Edku and Rashid is the Kobi variety. The trees are not grown in large numbers and the fruits are shipped hard ripe in date-leaf crates to be consumed fresh. They were seen in Cairo from December 16 to 20. The fruits are about 1¼ inches long and seven-eighths of an inch broad, the greatest diameter at a little above the middle, from which they contract abruptly to a broadly rounded apex. The color is close to "amaranth purple." ripening to a "blackish red-purple" or "burnt lake" (all R. XII). The rather brittle flesh is sweetish, but without character, and it ferments readily during ripening.

The oblong seed is about seven-eighths of an inch long, three-eighths of an inch broad, slightly rough, with broadly rounded ends. The apical portion is colored from

"russet" to "Mars brown" (R. XV), with the base close to "chamois" or "cream buff" (R. XXX). The germ pore is usually placed centrally and the ventral furrow is narrow and shallow.

This variety is of value only as it prolongs the season of fresh dates.

KOSHA.

This belongs to the dry-date class, and the fruit only was seen, and in the dry condition.

Fruits 1½ to 1¾ inches long, three-fourths to seven-eighths of an inch broad, distinctly compressed, oblique and unsymmetrical, sometimes slightly curved, broadest at about one-third above the base, tapering rather abruptly to an obtuse apex (Pl. XII).

The surface, with nearly smooth or slightly wrinkled areas, broken by areas of fine longitudinal folds with cross reticulations. The color is somewhat mottled, the darker portions being "bay" (R. II), with an area around the base of "sorghum brown" (R. XXXIX) and lighter patches of "clay color" (R. XXIX).

The fine granular flesh is "honey yellow" in the darker parts and "cartridge buff" (R. XXX) within. The flavor is remarkably sweet for a dry date, with the usual wheaty flavor and no trace of astringency. The quality will rank as excellent.

The seeds are seven-eighths of an inch to 1 inch long, about five-sixteenths of an inch broad, tapering toward the slightly apiculate apex, often with sharp lateral ridges or "wings." The small germ pore is usually about central, the ventral furrow being rather narrow and deep. The color of the seeds is nearest to "wood brown" (R. XI).

The sample of this fruit was included in a lot obtained at Merowe on the eve of departure from Dongola Province. The whole collection was mailed to Washington and the description of the varieties was not made till after the writer's return.

This variety is regarded as one of the best dry dates yet sampled, and steps will be taken to secure offshoots of it at a later date.

KULMA.[1]

The Kulma date is counted as one of the four chief varieties originally received into Dongola from Sukkot country. The leading men of Merowe say that this variety should not be planted near the Nile bank, where its roots will get too much water, but farther inland, where it will be sparingly irrigated.

FIG. 7.—Outlines of the Kulma date in fresh, ripe condition: from the governor's garden, Merowe, Dongola Province, Sudan. (Natural size.)

The only tree seen[2] had a rather short, heavy trunk and dense, broad spreading top. The leaves are 10 to 12 feet long, with stout ribs carrying their size well out toward the apex, where there is but a slight flexibility. The foliage is bluish green with heavy waxy bloom. The spine area is 18 to 24 inches, the spines heavy, acute, from 2 to 7 or 8 inches long, passing to stiff acute spike pinnæ 18 to 20 inches long, one-half to five-eighths of an inch broad. At about 36 to 40 inches from the base they pass into the normal pinnæ, which are 16 to 18 inches long and 1½ to 1¾ inches broad. They diminish in size but little till near the apex, where the pinnæ are 10 to 12 inches long and 1 to 1¾ inches wide. The spines and spike pinnæ are set at divergent and defen-

[1] In Burckhardt's vocabulary of the "Nouba" language, "kulma" is the transliteration for "big," and the name may be descriptive of the size of this variety. (Burckhardt, J. L. Travels in Nubia. Ed. 2, p. 145. London, 1822.)

[2] Only two offshoots were secured of this variety. One, from the tree in the Mudirieh Garden at Merowe, from which the description was made, was the gift of Col. H. W. Jackson, governor of Dongola Province. The other was the gift of Omda Mohammed Ahmed Ibrihim.

sive angles, about which the pinnæ fall into four rather regular ranks, with the valley of the blade broad. In the apical portion, the pinnæ fall mostly into two ranks, lying nearly parallel at an axial divergence of about 45°.

The fruits are 2½ inches long, 1⅛ inches broad a little above the middle, and taper to a narrower base and an obtuse apex (fig. 7). Their color is yellow, ripening to a dull "bay" (R. II), with the basal portion "honey yellow" or "Isabella color" (R. XXX). The rather soft flesh is a dull amber color, the inner portion satiny white with a large amount of tough fibrous "rag." The flavor is so rich as to be rather cloying, though of a quality which would be attractive to many people. The rather broad oval seed is about 1 inch long, corrugated, the germ pore placed somewhat apically, the ventral furrow being narrow and shallow.

From its large size, fine appearance, and rich flavor this little-known date is worthy of a careful trial, though before it could be ranked as a first-class variety cultural conditions would have to be developed which would eliminate the large amount of tough fiber.

SAIDY.

(Saidi, Wahi.)

Trees with heavy trunks and stiffly spreading leaves 10 to 14 feet long (Pl. IV, fig. 1), the heavy ribs with very broad bases.[1] There is a space of clear petiole of 12 to 15 inches below the first spines. The rib is strongly rounded dorsally and tapers but slowly, its outcurve being stiff rather than graceful.

The spine area is from 2½ to 3½ feet, the spines of medium weight or quite heavy, placed singly and rather scattered, from 2 inches long below to 7 or 8 inches in the upper area, and passing into a stiff ribbon pinnæ or spike pinnæ 20 to 24 inches long and one-half to three-fourths of an inch wide. The normal pinnæ following these at 4 to 5 feet are 20 to 24 inches long and 1¼ to 1⅝ inches wide, but dropping steadily in length to 12 to 14 inches near the apex. Their greatest width of 1½ to 1¾ inches is reached at about three-fourths of the blade length from the base. The pulvini are unusually heavy, deeply cream colored, or slightly brownish in exposed places. The pinnæ are rather coarse and harsh, 0.018 to 0.019 of an inch or sometimes 0.025 of an inch thick and conspicuously bluish green with a heavy waxy bloom. This bluish-green color is very noticeable when the leaves are seen in a mass.

The 4-ranked arrangement of the pinnæ is conspicuous, and the narrow axial angles and strong angles with the blade plane formed by the lower antrorse pinnæ give the leaf a bristling and formidable appearance. The valley is close and narrow nearly to the apex of the blade. The pinnæ groups are of the normal types till quite near the apex, and the paired groups of the antrorse-retrorse type are largely in the majority.

The orange-yellow fruit stalks are strikingly long, of medium weight, or rather heavy in some cases.

The fruit[2] is 1½ to 1⅝ inches long, seven-eighths of an inch to 1 inch broad, blocky, with broad square base rounding to a broad obtuse apex (Pl. XIII). The skin is rather coarsely wrinkled both longitudinally and transversely and partially loosened from the flesh. The darker portions of the flesh have a translucent appearance and are nearest to "liver brown" (R. XIV) in color, with a delicate lavender bloom.

A basal zone of about one-fourth the length of the fruit is a "tawny olive" (R. XXIX) and is opaque in appearance. The flesh is three-sixteenths of an inch thick, firm, slightly granular, somewhat sticky: an outer zone of one-third of the thickness is of the exterior color, while the nearly transparent inner portion is close to "olive ocher," (R. XXX) with a little more suggestion of green.

The flavor is heavily sweet, rich, and a little cloying, but of the quality usually sought after by date purchasers in this country. After being packed seven months

[1] Notes made near the Temple of Nadurah, Khargeh Oasis, October 8, 1913.

[2] Described from fruit packed in cartons at Sheik Abu Bakr's, Rashida, Dakhleh Oasis, Oct. 18, 1913.

the quality is in no way impaired, and where not reached by weevils these dates would sell as well as at Thanksgiving time. No variety has been tried that stood the test better (Pl. XIV).

The seeds are five-sixteenths of an inch to 1 inch in length, three-eighths of an inch broad, smoothly rounded, the germ pore nearly central, the ventral furrow narrow and shallow, the color close to "tawny olive" (R. XXIX).

The fruits, packed in paper boxes and rather dry, averaged 35 to 40 to the pound. The percentage of seed weight to the total weight of fruit is 11.6, a ratio too high to mark this date as of absolutely first quality, yet with its other good qualities a great deal can be allowed in this respect.

These fruits ripen in the heat of the Libyan oases in October. Whether they will find sufficient heat for their perfection in any portion of the United States outside of the Salton Basin is perhaps doubtful. Temperature records of only one of these oases have been kept. A record of seven years at Dakhleh (Table I), shows a mean annual temperature of 74° F., which is slightly higher than that of Palm Springs, Cal.; and for the growing months of February to October, inclusive, a mean of 78.40° F. The summation of heat units is about the same as that of Tuggurt (Tougourt) in Algeria (table on p. 8), which suggests about the same temperature requirements as for the Deglet Noor. This indicates that this variety may be expected to reach maturity in the United States only in the heat conditions afforded by the Salton Basin of California or in the hot lower portion of the Colorado Valley from Needles to the Mexican line.

This variety, as seen by the writer, is the great export date of Khargeh and Dakhleh oases, and Sheik Abu Bakr, of Dakhleh, is authority for the statement that it is the chief date of the entire chain of oases of the Libyan Desert, from Siwah at the northwest, which lies about 400 miles southwest of Cairo, through Baharieh, Farafreh, and Dakhleh to Khargeh, the most southeasterly, lying 120 miles due west of Luxor.[1]

They have together an extreme north to south range of about 300 miles through a practically rainless region of dry air and intense desert heat. Siwah is said to be 78 feet below sea level. The other oases of the chain lie at elevations ranging from near sea level to three or four hundred feet above. Only Khargeh has railway connection with the Nile Valley; from the other oases the dates reach the Nile Valley by camel caravans commanded by Bedouin traders who buy the entire export crop of the desert people at their gardens.

The common occurrence of this date as the leading variety of the widely detached oases, while it is unknown in the Nile Valley,[2] suggests that they have had it in possession a long time, perhaps dating back to a period when allegiance to the Egyptian Government was not acknowledged and when communication was much more free and regular by the desert trails between the oases than that between the oases and the Nile Valley.

In the enumeration of the taxed date palms of Upper Egypt for 1907 the oasis of Baharieh is credited with 98,996, Dakhleh with 106,344, and Kargeh with 65,521, or a total of nearly 271,000 trees. Siwah and Farafreh are not reported.

From observations in Kargeh and Dakhleh and from the crop seen coming in from Baharieh, the writer is satisfied that considerably more than half of the trees in these three oases are of the Saidy variety, so that a low estimate would give 150,000 or 200,000 of these without including Siwah Oasis, where it is known to be the chief tree.

[1] Siwah is approximately 25° 30′ east of Greenwich and in 29° north latitude. Baharieh is crossed by the meridian of 29° and lies just north of 28° latitude. Farafreh lies close to the intersection of the meridian of 28° and the parallel of 27°. Dakhleh lies about equally on either side of the meridian of 29° and at about 25° 30′ north latitude. Khargeh lies with its greatest extent north and south about 30° 40′ east and from 24° 30′ to 26° north latitide (Pl. I).

[2] Unless the Siwah of Gizeh Province proves to be identical.

A very interesting bit of exploration history attaches to the procuring of this variety. Mr. David Fairchild, in an agricultural exploration of Egypt in 1901, purchased in Fayum a quantity of dates which he regarded as the finest he had seen in Egypt and which he was told were "Wahi" from the village of Siwah in the oasis of Baharieh. Though it was known to Mr. Fairchild that the term "Wahi" had reference to the oasis, it was supposed for many years that this was the varietal name of the date, and three different men had been dispatched with commissions from the Office of Foreign Seed and Plant Introduction to procure offshoots of this desirable variety. During the writer's trip to Dakhleh Oasis he learned from Sheik Abu Bakr that Saidy, the export date of the Libyan oases, is sold by the Bedouin traders when they reach the Nile Valley as "Wahi," the date from "el Wah," or the oasis. Samples of the fruit, purchased in the markets of Wasta, in Fayum, and directly from the traders under the name of "Wahi," proved perfectly identical with samples of Saidy brought from Dakhleh and Khargeh, establishing beyond question the Saidy as the long sought "Wahi." Though 108 Saidy offshoots were purchased in Khargeh on this trip, the first introduction of Saidy offshoots dates from the purchase through Mr. H. A. Rankin, S. P. I. No. 11485, in 1904, said to be "from Fayum." As this variety is not known in the Fayum country, it is probable that Mr. Rankin secured the offshoots through Bedouin traders from the oasis of Baharieh, between which points there is constant traffic.

Another interesting phase of the whole discussion is the very close resemblance, if not the absolute identity, of the Saidy with the Siwah grown in the upper sections of Gizeh Province.

SAMANY, SAMIANI, OR RASHEDI.

(Trees noted in the Gizeh Garden; fruit in Cairo markets from Edku.)

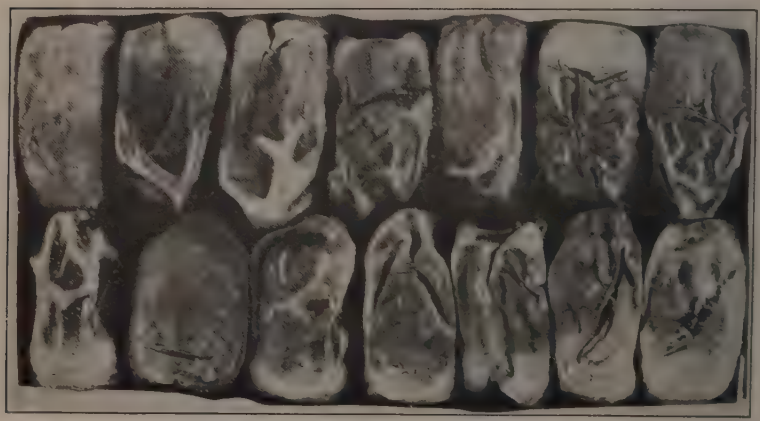
The Samany date is one of the most striking and characteristic varieties of Lower Egypt, and, by the natives, it is counted one of the best.

The trees are very heavy bodied, not as tall as Zagloul, and have longer leaves than any variety the writer has ever measured—16½ feet being the length of one specimen, seemingly not above the average. The ribs are very heavy and strongly rounded at the base, sometimes 12 to 14 inches broad at the attachment with the trunk, and taper to the apex so as to give a heavy but graceful curve to these immense leaves, which are rather wide apart, forming an open crown. There are 12 to 16 inches of clear petiole below the spines. The long, slender, acute spines occupy about 3 feet of the rib; the long, rather soft pinnæ are arranged quite evenly, giving a broad, nearly smooth open blade with the breadth carried well out to the soft, flexible tip. In the group arrangement of the pinnæ the antrorse class disappear at about the middle of the blade, leaving the outer portion largely dominated by the introrse pinnæ, which form angles of 40° to 58° with the axis. As a variety to afford an imposing ornamental tree, in addition to producing a desirable fruit, nothing finer than this can be selected from the Egyptian list.

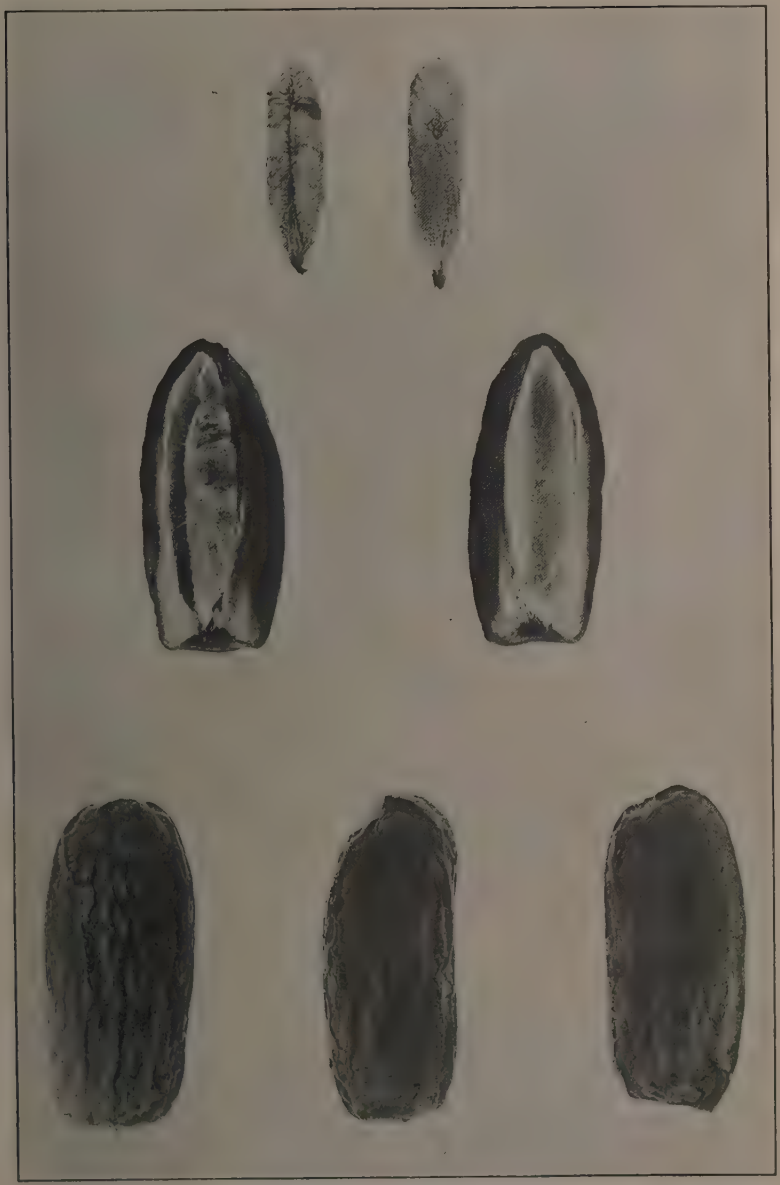
In fruit this variety is easily the most striking and peculiar of all the delta varieties. The heavy compact bunches are borne unevenly on coarse, strong strands, or "shamrokh." The fruits are about 2 to 2¼ inches long, 1½ inches broad, rather oblique, and inclined to be oblong for about two-thirds of the length, when the diameter is reduced so abruptly as to form a sort of shoulder on the outer side, and it narrows to an obtuse, unsymmetrical apex (fig. 8).

The ground color of the fruit is close to "orange-buff" (R. III) or "Capucine orange" (R. III), shaded, mottled, and streaked longitudinally with a color for which "pomegranate purple" (R. XII) is the nearest definition, yet hardly satisfactory. This describes the hard, half-ripe, or "rutab," state in which this date is always marketed. The flesh is then firm to brittleness, white, fine grained, juicy, mildly sweet, with scarcely a trace of astringency or tannic-acid flavor. In this stage it is greatly relished

SAMPLES OF PACKED SAIDY DATES FROM THE DAKHLEH OASIS. (NATURAL SIZE.)



SAMPLE BOX OF SAIDY DATES FROM THE DAKHLEH OASIS, AS PACKED BY THE CORPORATION OF WESTERN EGYPT.



SAMPLES OF SULTANY DATES FROM THE DAKHLEH OASIS. (NATURAL SIZE.)

SAMPLES OF TAMR DATES FROM THE KHARGEH OASIS. (NATURAL SIZE.)

by the Egyptian people, apparently in much the same way as they like a stalk of sugar cane. In a ripe state this date is a disappointment, both as to appearance and as to quality.

It ripens to an unattractive, nondescript color, as near "purple-drab" as to anything, and mottled with "dark purple-drab" (both R. XLV). The very thin skin wrinkles slightly, slipping with some difficulty from the flesh, from which it is parted by a thin layer of sirupy sap.

The color of the flesh is a pale "honey yellow" (R. XXX), nearly white at the center, and with some "rag" surrounding the seed. The flavor is insipid, and it ranks very low in keeping quality, not containing sugar enough to prevent quick souring. The seed is coarse and rough, in the partially ripe fruit completely filling the cavity. Its germ pore is placed slightly nearest the base, and the furrow is broad and shallow.

This variety is a good deal planted in private grounds about Alexandria and Ramleh, but the only regions of its culture on a commercial scale are about Edku and Rashid, the native name for Rosetta. While some of these plantations are within reach of irrigation water, more frequently they are grown in dune slopes of pure sand, where the roots readily reach a brackish ground water (Pl. II, fig. 2). The cool, humid climate of the coastal region seems especially favorable to this succulent variety, which is one of the latest to mature.

In some of the Cairo fruit stores glaced dates were on sale in fancy cartons, prepared by a Greek firm in Alexandria, which, from the peculiar form of the fruit, could have been no other than this variety.

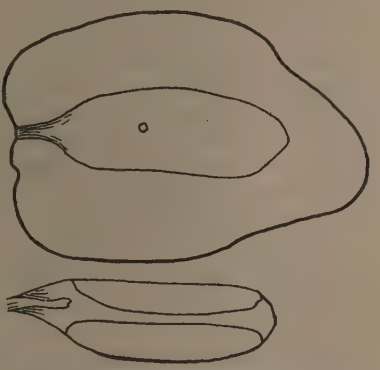


FIG. 8.—Outlines of the Samany date in "rutab" (fresh) condition, on the Cairo market, November 16, 1913; shipped from Edku, on the Mediterranean coast. (Natural size.)

The offshoots of the Samany command the highest prices of any variety in Egypt for the reason that they are in great demand for planting in the gardens of new country and suburban places which are being built up around Alexandria. But few of this variety have been planted around Cairo. The only ones observed are in the Gizeh Garden, next to the Zoological Gardens and formerly a part of the palace grounds of Ismail Pasha, where they are planted along avenues with Zagloul, Bint Aischa, and several other varieties.

SIWAH (SIWI).

(Notes made near Hauamdiyeh, November 5 and 17, 1913.)

Trees of the Siwah date have large heavy trunks with coarse scales from the leaf bases and heavy, stiffly spreading tops. The leaves are 14 to 15½ feet long, with very heavy bases, strongly rounded lower rib, which tapers gradually but still remains stiff and heavy at the apex. The spine area is from 2½ to 4 feet, the spines very strong and heavy, bluntly acute, from 2 to 8 or 9 inches long. The stiff, coarse pinnæ following these are 24 to 29 inches long and 1 to 1¼ inches broad. They diminish regularly in length toward the apex and increase in breadth up to 10 or even 11 feet from the base, being usually 17 to 20 inches long and 1¾ to 2 inches broad at 8 to 10 feet from the base and 11 to 14 inches long and 1¼ to 1½ inches broad at the apex. Many of the upper pinnæ have the proximal fold broadened into a wing and are decurrent. The pulvini on the spines are unusually heavy and dark cream colored, being somewhat lighter on the less exposed pinnæ. For the first 6 feet of the blade the pinnæ comprise only

the antrorse and retrorse classes in the paired antrorse-retrorse groups, above which the introrse pinnæ appear, and also the triple (antrorse-introrse-retrorse) groups with a few quadruple (antrorse-introrse-introrse-retrorse) groups. In the outer 2 feet of the blade the introrse class predominates, or all classes become merged. The 4-ranked arrangement of the pinnæ in the blade is strongly maintained, but is especially pronounced in the lower portion, where the bristling ranks of the antrorse pinnæ vary strongly from those of the retrorse and give to the leaf a strong attitude of defense. The remarkably long and heavy orange-colored fruitstalks of this variety are almost identifying in their character. They may be 2½ inches in diameter and 50 to 60 inches long to the fruiting head, or portion bearing the strands, or "shamrokh." The fruiting head is 16 to 24 inches long, bearing strands 24 to 40 inches long upon only the outer 12 to 18 inches of which the fruit is borne, the basal portion being straight and irregularly four sided.

The fruit is 1⅝ to 1½ inches long, 1 inch broad, oblong or slightly broadest a little beyond the middle, with a rather square blocky base and obtusely rounded apex. The color of the fruit on the tree is a brilliant yellow, not far from "wax yellow" (R. XVI) or "light cadmium" (R. IV). The fruits are picked before they are fully ripe and are dried in the sun on a hard earthen floor, or the floor may be spread with a thin layer of date leaves. The first quality of fruit ripens to a color near "hazel" (R. XIV) or "tawny" (R. XV), but it is semitransparent except the basal portion, which is often opaque and of a "honey yellow" or "chamois" color (R. XXX). Fruits of a very good quality may be considerably darker, close to "bay" or "chestnut" (R. II), but either class held against the light will show the seed through the flesh quite plainly. The skin is very thin and transparent, and the outer portion of the flesh is of the same shades given for the outside appearance, while the inner flesh is considerably lighter. In good "agwa" that has been packed several months the outside of the fruit is shiny, as though dipped in a sugar sirup, and is a little sticky.

The flesh is less sticky than the outside and a good deal granular. The flavor is a rich sugary sweet, with a suggestion of caramel, and very agreeable.

The seeds, large for the size of the fruit, are about three-fourths of an inch to 1 inch long, three-eighths of an inch broad, roundish in cross section, and may be called oblong oval in form, a little broader in the middle and with broadly rounded ends. The germ pore is about central, the ventral surface a little corrugated, the furrow narrow and shallow. The color is close to "wood brown" (R. XL).

When sufficiently cured the dates are packed solidly into strong, deep, circular baskets made from the braid of date-leaf pinnæ sewed spirally, and a cover of the same material is stitched closely on. The whole mass thus inclosed becomes sealed with the exuding sirup of the sticky dates and is practically air-tight. If cleanly and sanitary methods could be followed, there is no doubt that this method of packing is an excellent one, and there is reason to believe that a curing process goes on in the mass which gives a flavor and texture of flesh not secured when the individual dates are packed in their natural shape in paper cartons without compressing and so exposed to the air.

The rather large seed is all that prevents this date from being classed as a strictly first-class variety, judged by its actual merits as a date. That the product that goes on the market is not above third class needs only a view of it in the market stalls to prove. One has but to see the yards and the curing and packing in progress to be convinced that such a product is the only possible result of the antiquated and filthy, not to mention insanitary, methods employed. Dried on the bare, dust-covered ground or on a floor thinly spread with date leaves, covered with flies, swept with the dust of passing traffic, finally tramped with the naked feet into the huge date-leaf sacks, the writer was not surprised to learn that the wholesale price realized for these dates by the grower is only about 4 or 5 millièmes to the rotl, the equivalent of 2 or 2½ cents per pound.

In December the retail price of the Siwah in the native markets of Cairo was 1 piaster per rotl, while at the same time in the best fruit and provision stores, patronized by European customers, there was an active trade in the Algerian Deglet Noor, in fancy packages labeled "Dattes Muscades," at prices the equivalent of 5 piasters per rotl. From samples of Siwah dates obtained from private sources, carefully selected and packed for home use, the writer is convinced that the first quality of dates, packed in a modern and attractive way, would be competitors with the Algerian dates on at least an equal footing and would be the choice of many people of refined taste. Of course, not all of the Siwah crop could be converted into a first-class pack under the best of conditions, but a sufficiently large proportion, with proper methods, could be brought up to the first quality to make the difference in price between 1 piaster and 5 piasters per rotl run into a good many thousand pounds sterling for a year's output. What the French in Algeria and Tunis have done to improve the date output of those countries, what is recently being done with the dates of the Persian Gulf region, ought not to be beyond accomplishment for Egypt with such dates as the Siwah and the Saidy for a foundation.

A question of nomenclature comes in here which is rather typical of the whole date situation in Egypt, and arises from the habit of the people of giving to a date the name of the locality from which it is brought, as "Wahi" for any date from the oases, "Yemeny" for dates from the Yemen district of Arabia, etc.

In the shipment of date offshoots received by Mr. Fairchild in 1901, through Mr. Em. C. Zervudachi, of Alexandria, one lot, given the S. P. I. No. 7632, was labeled "Oga de Bedrichen" and in some of the lists this name became transformed into "Oga de Bedreschen." Two trees under the above number and one received without a label were recognized by the writer as identical, and careful notes were made of the leaf and fruit characters, all of which were strongly marked and characteristic.

As no such name occurred in any of the published lists of Egyptian dates, there was naturally considerable interest in the true identity of so conspicuous a variety. Consequently, on arriving in Egypt one of the writer's earliest excursions from Cairo was to the native village of Bedrashen (variant spellings, "Badrashen" and "Badreshein"), a prominent date growing and shipping point on the west bank of the Nile, about 10 miles above Cairo. It is the stopping point for excursionists to the historic site of ancient Memphis and Sakkara, and perhaps no spot in the Nile Valley has witnessed more of the glory of ancient Egypt than this. At the present time there are no more magnificent date groves to be found in Egypt than those that surround this town, Hauamdiyeh, and a number of other villages between Bedrashen and Gizeh. The soil is a rich sandy loam, capable of producing heavy crops of general produce, and maize is frequently grown beneath the date trees (Pl. III, fig. 2). Going out among the date growers and inquiring for a variety named Oga de Bedrashen, brought the unvarying response that they knew of no such variety. They had only Siwah and Amhat, a few Hamrawi, and some "balady," their name for dates of local origin, or seedlings. On looking over their gardens the young trees of the Siwah had a familiar appearance, and a later visit gave time for the study of the leaf and fruiting characters in detail. Only one conclusion could be reached—the variety we had received under the name of "Oga de Bedrichen" is no other than the Siwah, the leading variety of the Bedrashen and Hauamdiyeh district and the chief packing date of Upper Egypt. The mudirieh of Gizeh has 435,000 taxed date trees, and at a rough estimate 100,000 of them are of the Siwah variety. With the exception of a few trees that are being planted in Fayum, there seems to be little known of this variety outside of Gizeh Province, and within that it is chiefly confined to the section south of Gizeh station and to a district on the west side of the valley and north of the pyramids. Of its origin or the date of its introduction into this district, nothing could be learned. The name at once suggested an introduction from the oasis of that

name. But unlike Dongola Province, where they preserve a distinct tradition of having obtained their date varieties from the Sukkot country, these people have no record of the introduction of the Siwah into their country, and they insist that it originated there.

The situation is further complicated by the fact that there is an exceedingly close resemblance between the Siwah and the Saidy, the great export date common to the entire chain of oases of Western Egypt, from Siwah at the northwest, to Baharieh, Farafreh, Dakhleh, and around to Khargeh. A most careful comparison of all the characters of trunk, leaf, and fruiting stalk fails to show points of constant difference between these varieties, unless it is in the thickness of the fruiting stalk, which, on the whole, seems to be lighter in weight in the Saidy than in the Siwah. How growing in the same soil conditions would affect them in this respect can only be determined by trial. The fruits are so closely related in character that the oasis Saidy variety, as packed and brought to the Nile Valley, shows no constant differences that will distinguish them from the Siwah of Bedrashen, though individual lots may vary considerably. The question again arises of how the varieties would behave if grown side by side, in identical soil conditions. The rich soil of Bedrashen and Hauamdiyeh might produce somewhat different results in a variety than would be produced in the rather poor, sandy soils of Khargeh and Dakhleh Oases, in which the writer studied the Saidy. Trees of "Saydy," S. P. I. No. 11485, fruited in 1912 in a very sandy soil at the Mecca Date Garden in California, and were considered by Mr. Bruce Drummond, in charge of the Indio and Mecca Date Gardens, to be identical with the "Oga de Bedrichen" (Siwah) of Tempe. The writer at first concurred in this opinion, but with a more detailed examination of the Mecca plants concluded that they were distinct. After seeing both varieties, as grown in Egypt, to still regard them as distinct, with so many points of identity, can only be accounted for in one way. The Siwah, from its narrow dissemination, is possibly the younger variety and a seedling springing from the Saidy, the fruit of which has found its market in the valley for many years. Analogy for an even closer resemblance of a seedling to its parent is found in Mr. James Reed's "Pioneer" seedling of the Deglet Noor, produced at Thermal, Cal.

There is another point that makes it of importance that the Saidy and the Siwah should be tested in identical situations. The ripening of the two varieties is about simultaneous, in spite of the remoteness of the localities and marked difference in the temperature. At Dakhleh the mean temperature for the nine months of the growing period, from flowering to date harvest, February to October, inclusive, is 78.40 °F. That of Heluan, the nearest record point to the Siwah date field, for the same period is 72.54° F., or 5.86 degrees lower. As shown in Table I, the summation of heat units from May to October, inclusive, is 1,079 higher at Dakhleh than at Heluan. These figures, showing so many more available heat units for the Saidy than for the Siwah, would lead us to expect it to ripen earlier, provided the varieties are identical, and they offer the strongest argument presented in support of a varietal difference between the two.

The maximum yield of Siwah at Bedrashen is given as 100 kantars of 320 pounds to the feddan, practically 1 acre, or often only 60 or 70 kantars. The maximum yield would then be 32,000 pounds to the feddan, which, allowing 100 trees to the feddan, would give a yield of 320 pounds to the tree. At 80 piasters per kantar the money return would be £80, or $400. Placing the yield at 60 kantars, the more probable average, the crop would be 19,200 pounds, or 192 pounds to the tree. At the minimum price of 60 piasters per kantar the return would be £36 to the feddan, or $180 per acre; 70 kantars, a medium yield reported, would equal 22,400 pounds, or 224 pounds to the tree, a not unreasonable yield. This, at 80 piasters, would give £56, or $280 to the feddan or acre. This, it should be remembered, is on land valued at the rate of £100 to £200 per feddan.

SULTANY.

(Known only in limited numbers in the Dakhleh Oasis.)

Trees of the Sultany variety are tall with moderately heavy trunks, the ribs being of medium breadth at the base and tapering rather slightly toward the apex. The spine area is about 28 per cent of the blade length, the spines slender and acute, 2 or 3 to 5 or 6 inches long, passing to ribbon pinnæ of three-fourths of an inch broad and 17 to 18 inches long at 4 feet. The greatest length of normal pinnæ, about 22 inches, follow these, but the length of 16 to 20 inches is maintained nearly to the apex, where they drop to a length of only 12 to 16 inches. The greatest breadth of 1½ inches is reached by a portion of the pinnæ at 7 to 10 feet from the base.

These leaves have several remarkable characters, the high number of antrorse pinnæ, more than half of the entire number, being the most striking feature. These are set at very narrow angles of axial divergence and diverge strongly from the plane, giving a narrow valley bordered by strongly antrorse pinnæ that are well placed for defense. The unusually small number of introrse pinnæ stand at angles of 45° to 69°. The retrorse pinnæ form axial angles varying from 30° to 45°, but lie in the blade plane or at slightly dorsal angles. The thickness of the pinnæ varies from 0.018 to 0.021 of an inch. The general color is bluish green, with a heavy waxy coating. The pulvini are large, with some tendency to being caudate, with a few groups coalescent. The fruit stalks are moderately long, the strands (shamrokh) are long, and both are bright orange.

The unripened fruit is a waxy yellow. The mature fruit is oblong, 1⅞ to 2 inches long, seven-eighths of an inch broad by three-fourths of an inch deep, showing a distinct dorso-ventral flattening, with sides marginate toward the apex. The meeting of the marginal ridge by a slight or decided curve at the abruptly apiculate apex gives an obtuse wedge form, which is a character of this variety. The greater flattening of the ventral face and the curve of the marginal ridge in that direction are sufficiently pronounced to enable one to determine by inspection the dorsal and ventral surfaces of the fruit, as is proved by sectioning and disclosing the seed (Pl. XV).

The surface of this fruit has many small longitudinal furrows united by finer transverse reticulations.

The darker apical portions are colored "bay" or "chestnut" (R. II) with lighter portions from "honey yellow" to "cream buff" (R. XXX). There is a thin "lavender" (R. XXXVI) bloom over all.

The firm, nearly dry flesh is from one-eighth to three-sixteenths of an inch thick. The outer, more sirupy parts are colored like the darker portions exteriorly, the inner layer a "cartridge buff" (R. XXX). The seeds, about 1¼ inches long and three-eighths of an inch broad, are a good deal corrugated. They taper slightly toward the base and have a broadly rounded apex. The germ pore is about three-fifths of the seed length from the base, the ventral furrow being broad and shallow.

Beneath the rather closely adhering membranaceous coating the seeds are "fawn color" (R. XL).

In the atmospheric conditions of Washington these fruits run 40 or 42 to the pound, weighed six months after harvest. The seeds constitute about 13 per cent of the gross weight, a ratio which must be expected to run higher in dry dates than in the moist varieties.

This variety is believed by Mr. Brown, Horticulturist of the Egyptian Ministry of Agriculture, to be the true Sultany, though there are one or two other varieties in the Nile Valley which are called by that name. This is only known to occur in Dakhleh Oasis and only eight trees of it are definitely known. Of these, all but one have passed the offshoot-bearing stage. The eighth tree proved to be a "thirsty" one, located on a ditch from a failing well. This had two or three grown "daughters," on one of which were two small offshoots of a size to move and several which were too small

to disturb. A contract was made for the regular watering of this tree by hand and a price agreed upon for the offshoots as they become large enough to remove. Owners of trees of this variety keep their fruits to set before guests or to send as presents. It could not be learned that they had ever been grown in commercial quantities. The fruit of this variety will take first rank in the dry-date class.

TAMR.

A third-rate date found in considerable numbers in Khargeh and Dakhleh Oases. Its chief interest lies in the fact that it bears some resemblance to the Saidy and that it is mixed with the inferior grades of the latter variety and sold to the Bedouin traders at low prices for consumption by the poorer people. While hardly to be classed as a dry date, it may pass as semidry.

The fruits are about 1⅜ inches in length and three-fourths to seven-eighths of an inch in diameter, with square blocky base, oblong form, and broad, abruptly rounded apex. They are sparsely and rather coarsely wrinkled and reticulate, but with more of smooth surface than is usual (Pl. XVI).

In color the brighter parts are "mahogany red" or "chestnut" (R. II) or more often near to "russet" (R. XV), with lighter basal portions "tawny olive" (R. XXIX) or clay color. The rather dry flesh is sweet, without richness or characteristic flavor. The seeds might aptly be called moccasin shaped. They are flattened, about seven-eighths of an inch long, three-eighths or seven-sixteenths of an inch broad at one-third the length from the broadly rounded apex, and taper from this point to a rather broad base. The ventral furrow is broad, rather shallow, and corrugated, the germ pore being nearly central. Inside the closely adhering membranaceous coating the seeds are colored a dark "wood brown" (R. XL).

ZAGLOUL.[1]

(Notes from Gizeh Garden, Cairo, Nov. 12, 1913.)

Except for a few trees in the older palace gardens around Cairo, including those from which these notes were taken, the culture of the Zagloul variety is confined to the cool regions of the Mediterranean coast, the greatest number of trees being found around Rosetta and Edku, but the fruit is produced in considerable quantities around Ramleh and Alexandria.

The trees are very tall, but more slender than those of Samany, and the crowns are not as spreading. The leaves are 11 to 12 feet long, the rib rather light, small, and inclined to be flattened at the base, but tapering rather slowly toward the apex, so that its curving is stiff, rather than graceful.

The spine area is very short, only 15 to 18 inches, the spines 1½ to 6 inches long, slender, weak and acute, usually placed singly.

The pinnæ in the lower part of the blade range from 18 to 26 inches in length, 22 to 25 inches long through the middle of the blade, and diminish to 12 or 15 inches at the apex. They are rather narrow, not more than an inch broad in the lower portion of the blade, and not exceeding 1½ inches in the middle portion; smooth, rather soft, and seldom acute.

The paired groups are greatly in the majority, and quadruple groups are infrequent. The pulvini are inconspicuous and none are caudate or coalescent. The fruitstalks are short, heavy, erect or but little outcurved, the strands (shamrokh) being of medium length, rather coarse.

The fruits are 2⅜ to 2¾ inches long and 1¼ inches broad, usually oblique and unsymmetrical, the broadest portion about three-fifths of the distance from the base, from

[1] This is the name of an Egyptian family. It is stated that one Zagloul was the ruler of the Rashid country many years ago and that this date was named for him.

which it rounds unequally to an obtuse apex (fig. 9). The brilliant and striking color of this fruit is rather elusive when one tries to place it. In some specimens a deep "pomegranate purple" (R. XII) is the most apt description, while others are better described as "carmine," deepening to "ox-blood red" (R. I). Either on the trees or in the market stalls this date has the most attractive appearance of any Egyptian variety. The skin is thin, and as the fruit ripens it easily slips from the flesh. In the condition usually marketed the flesh, about three-eighths of an inch thick, is crisp, brittle, juicy, sugary sweet, with but a slight astringency. Its color is best described as "maize yellow" (R. IV), but with a zone on the outside of about 2 mm. thickness of a deeper tint. The seeds are large, irregular oblong, roughly corrugated, and usually imperfectly filled out at the base, the germ pore central, the ventral furrow irregular, but usually shallow and open. The darker parts of the seed are colored "tawny olive" (R. XXIX), shading to "olive-buff" (R. XL).

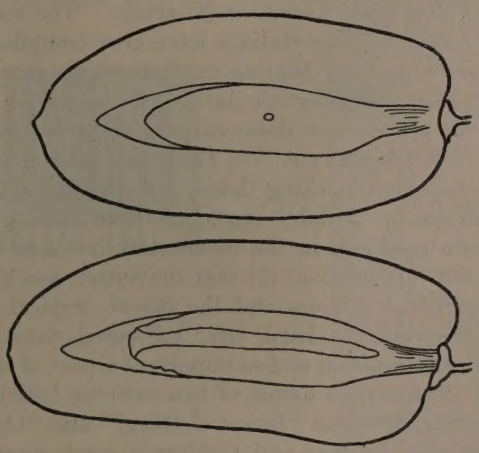


FIG. 9.—Outlines of the Zagloul date, two variations, in "rutab" (fresh) condition, on the Cairo market, November, 1913; shipped from Edku, on the Mediterranean coast. (Natural size.)

The fruits of the trees in the Gizeh Garden were "ripe," that is, marketable, the first week in November. The variety did not appear on the market from the coast region till about November 17. From that time until the middle of December there was a steady shipment, but they did not remain on the market as late as the Samany. It is stated that a few of both this variety and the Samany come to the Alexandria market from the cooler spots up the coast nearly throughout the winter.

Doctor Eisen's paragraph relating to S. P. I. No. 32327, must be based on a good deal of misinformation, both as to locality and time of ripening. This variety does not occur in the Fayum at all, and the few trees in Cairo gardens cut no figure commercially.

SUMMARY.

Date culture in Egypt and the Sudan is of very ancient origin, extending far back of the Christian era. The present number of date trees in these countries approximates 9,000,000, with an annual product valued at about $1 per tree. Of these trees, not to exceed one-fourth are of 12 important commercial varieties, the remainder chiefly "balady," or seedling, trees producing fruits of inferior grade commanding low prices.

Date culture in the Nile Valley extends with little interruption from the Mediterranean coast to Khartum, a distance of about 1,100 miles, the longest continuous north and south extent of date culture in the world. This embraces a range in mean annual temperature

of more than 15 degrees and, equally important, a range in the percentage of mean relative humidity varying from 74 per cent at Port Said to only 24 per cent in Dongola Province in the Sudan.

For convenience in study, the region has been divided into three zones, designated as (1) the maritime subtropical, comprising the Nile delta below Cairo; (2) the desert subtropical, comprising the Nile Valley from Cairo to Aswan and the western oases; and (3) the desert tropical, comprising the date-growing sections of the Nile Valley from Aswan to Khartum. The records of 12 Egyptian and Sudan weather stations have been compiled and arranged in a table, showing their bearing on date requirements.

The characteristic date varieties of each zone are grouped to show the influence of these varying climatic conditions and the important facts brought out: (1) That the cool and humid maritime zone produces few packing dates, but almost exclusively those used in the fresh, or "rutab," state; (2) that packing dates of superior quality are produced in the moderately hot and dry portions of the desert subtropical zone; (3) that the hotter, less humid portion of the desert subtropical zone and the desert tropical zone produce almost exclusively the hard, dry, self-cured dates, so easy of storage and transportation and so important a part of the diet of the Arab people.

The correct names of two varieties listed in the early importations from Egypt as "Birket el Haggi" and "Oga de Bedrichen," promising in Arizona and California, were ascertained by visits to their original localities.

The identity of the date of which Mr. David Fairchild purchased the fruit as "Wahi" in Fayum in 1901, with the Saidy, the great packing date of the western oases, was learned on a trip to Khargeh and Dakhleh.

The Ibrimi and Sukkoti varieties of earlier published lists were found to be synonyms of Barakawi, the dry date of greatest commercial importance in the Sudan, probably originating in Sukkot.

Of the 22 varieties of dates described, 14 have not been previously published, and of the remaining 8 the descriptions are more complete and are believed to be more accurate than any heretofore published.

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
20 CENTS PER COPY

▽